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OVERSIGHT ON THE FEDERAL AVIATION ADMINISTRATION FISCAL YEAR 1987 RESEARCH, ENGINEERING AND DEVELOPMENT BUDGET REQUEST

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION
AVIATION AND MATERIALS

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

SECOND SESSION

APRIL 22, 23, 1986

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OVERSIGHT ON THE FEDERAL AVIATION ADMINISTRATION FISCAL YEAR 1987 RESEARCH, ENGINEERING, AND DEVELOPMENT BUDGET REQUEST

TUESDAY, APRIL 22, 1986

House of Representatives,
Committee on Science and Technology,
Subcommittee on Transportation, Aviation and Materials,
Washington, DC.

The subcommittee met, pursuant to call, at 9:40 a.m., in room 2325, Rayburn House Office Building, George E. Brown, Jr. (chairman of the subcommittee) presiding.

Mr. Brown. The subcommittee will come to order.

Today the subcommittee will turn to a review of the Federal Aviation Administration's program of research, engineering, and development.

The primary purposes of this program are: First, to lay the basis for future technological improvements in the nationwide system for controlling air traffic; and second, to conduct research in support of the agency's rulemaking responsibilities.

In recent years most activities of the former variety have been part of a larger $12 billion effort to modernize the air traffic control system, known as the national airspace system plan, or NAS plan.

The implementation part of NAS is contained in another account called facilities and equipment, which is jurisdictionally within the purview of the Public Work Subcommittee on Aviation. But because of the important relationship between development and implementation, we have worked closely with our colleagues on the Aviation Subcommittee in reviewing NAS plan progress and funding issues each year.

This year we are concerned that needed safety and productivity improvements, promised by NAS, may be delayed because the administration continues to use the Aviation Trust Fund as a way of achieving a modest improvement in the Federal deficit, rather than applying it to the purpose intended by the people who contribute to it, the flying public. For example, the request for research, engineering, and development in fiscal year 1987, when combined with previous appropriations, represents a $126 million shortfall below the authorization of $1.1 billion. For facilities and engineering, the shortfall over the same 5-year period is $1.56 billion.

Clearly, these kinds of numbers indicate trouble for the plans that FAA made, based on the 5-year authorization and trust fund structures.

To examine this question, we are going to begin our review of the FAA's Research Program and the NAS plan by hearing from the various user groups that contribute to the trust fund and have a vested interest in assuring the money is well spent. We are particularly interested in revalidating the level of need for NAS and some of its major components, in the light of current conditions in the air transportation system.

Later we will hear a detailed progress report from the FAA itself and then from the General Accounting Office on some specific concerns about the management approach being taken in selected NAS elements.

I will now recognize Mr. Packard for any opening statement that he may wish to make.

[The prepared opening statement of Mr. Brown follows:]

Honorable George E. Brown, Jr., Chairman
Subcommittee on Transportation, Aviation and Materials
Committee on Science and Technology
U. S. House of Representatives

April 22, 1986

Oversight of the Federal Aviation Administration's FY 87 Research, Engineering and Development Programs

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The primary purposes of this program are: (1) to lay the basis for future technological improvements in the nationwide system for controlling air traffic; and, (2) to conduct research in support of the agency's rulemaking responsibilities.

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Later we will hear a detailed progress report from the FAA itself and then from the General Accounting Office on some specific concerns about the management approach being taken in selected NAS elements.

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Mr. **Packard**. Thank you, Mr. Chairman. I will read the opening statement of Mr. Tom Lewis, who is not here at the present time.

Mr. Chairman, as you know, it has been over 4 years since FAA responded to this subcommittee's request for a long-range comprehensive plan for modernizing the air traffic control system. The plan submitted by FAA, the national airspace systems plan, was strongly supported by nearly all the segments of the aviation community. Surely no one can deny that modernizing the air traffic control system is as important today as when the Brown Book was first submitted, and yet I sense that some of the early enthusiasm for the NAS plan has eroded.

The program has experienced a number of delays and not all due to funding shortfalls, but clearly funding shortfalls has had an impact and a threat of major delays in the future concerns me greatly. I am concerned that FAA's departure from the full funding approach for a number of major systems procurements is only the tip of the iceberg. This is not the way to save money. It only adds confusion and increases the risk of disrupting the acquisition of critical elements of the system.

The most effective solution to ending this yearly debate over the funds for NAS is to remove the aviation trust fund from the unified budget process. I have consistently supported this approach, and am currently a cosponsor on legislation which would accomplish this.

Mr. Chairman, I welcome our witnesses here today, and I am sure that they share my frustration over the delays in this much needed program, and I look forward to hearing their views on—and any suggestions that they might be able to offer, to get the national airspace system plan back on track. Thank you.

Mr. **Brown**. Thank you, Mr. Packard.

We have set this up with three panels of witnesses, and this has been done as a matter of convenience more than anything else. Since some of the panel members are not here, we are going to repackage the panels, and I am going to invite the following to come to the table to start the hearings off: Mr. J. Donald Reilly, executive director of the Airport Operators Council International; Mr. Robert A. Cooke, vice president for operation of National Business Aircraft Association; and Mr. Roger Fleming, senior vice president for technical services at the Air Transport Association.

You gentlemen all get along with each other, don't you, so you can all sit at the same table.

Mr. **Reilly**. Except at hearings.

Mr. **Brown**. Except at hearings. You have bitter fights on that.

All right, can we start, then, Mr. Reilly, with you, and we will go through each of your statements, and then we will have a few questions after you finish.

STATEMENTS OF J. DONALD REILLY, EXECUTIVE DIRECTOR, AIRPORT OPERATIONS COUNCIL INTERNATIONAL; ROBERT A. COOKE, VICE PRESIDENT, OPERATIONS, NATIONAL BUSINESS AIRCRAFT ASSOCIATION, INC.; AND J. ROGER FLEMING, SENIOR VICE PRESIDENT, TECHNICAL SERVICES, AIR TRANSPORT ASSOCIATION OF AMERICA

Mr. **Reilly**. Thank you, Mr. Chairman. Good morning to the subcommittee. It is our great pleasure to be here this morning to talk particularly about AIP airport moneys and R&D moneys.

Mr. Chairman, I have two statements to present today, the first on behalf of the Airport Operators Council International, representing the major airports in the United States, and the second, a statement on behalf of the Industry Task Force on Airport Capacity, Improvement and Delay Reduction. The second statement I am presenting as chairman of that group. It is a task force that was

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formed under the auspices of the FAA back in 1982, composed of some 22 representatives from all major segments of aviation.

First of all, though, Mr. Chairman, if I may, on behalf of the Airport Operators Council International, I would like to note that in addition to the dramatic figures that you opened your statement with regarding the various shortfalls in the programs, I would like to just add to the record the shortfalls in the AIP Airport Program.

For fiscal year 1986, we had an authorized level of AIP of $1.017 billion. This is the 1986 fiscal year program. That was first reduced by 9 percent in the 1986 continuing resolution, down to $925 million. It was then further reduced another 4.3 percent by Gramm-Rudman, down to $885 million, and it has been finally reduced by another $43.7 million by DOT to supplement FAA operations expenses, for a total now of only $841 million for fiscal 1986.

In fiscal 1987 we are doing even worse. Again, we were authorized $1.017 billion. That had been reduced in the continuing resolution for 1986 down to $925 million, and the funding request is $305 million below that for a total of only $712 million for fiscal year 1987.

Mr. Chairman, in 1982 aviation users were told by Congress and the administration that if they agreed to pay increased levels of taxes to a Federal airport and airways trust fund, they would be assured of specific and dedicated expenditures for airport and aviation facility improvements. As we all know, the authorized expenditure levels for the Airports Improvement Program has never been met throughout the existence of the program.

Airports support the AIP Program, but are totally disillusioned with the congressional and administration's implementation record of the trust fund. Consequently, we totally endorse all efforts by Senator Kassebaum and other congressional leaders to take the trust fund off budget. Further, if creation of a Federal corporation is necessary to protect the integrity of the trust fund moneys, then AOCI will seriously consider investigating and supporting that alternative. Or, Mr. Chairman, if airport defederalization with the right to implement a passage facility charge is the viable alternative, AOCI will further pursue that course.

Airport management cannot build a national airport system on the totally unreliable shifting sands of demonstrated Federal funding programs. A reliable Federal aviation funding program, even though totally paid for by the users has proven illusory.

Mr. Chairman, we need a reliable alternative for AIP, for F&E, for R&D, and if Congress can't provide it, then we suggest giving the industry the authority to do it themselves. Finally, AOCI urges this subcommittee and the Congress to give its full attention to creating a new separate FAA line item for airport R&D.

At this time, Mr. Chairman, on the specific subject of airport R&D needs, I would like, with your permission to present the separate testimony of the Industry Task Force on Airport Capacity Improvement and Delayed Reduction. I will present that testimony as the chairman of that industry group.

Mr. BROWN. That would be fine. As you know, the full text of both these statements will appear in the record. So any summary or abbreviation you wish to make will be perfectly OK.

Mr. REILLY. Thank you, Mr. Chairman.

A lack of airport capacity is a root source of today's aviation congestion problems. This will become even more evident as the national air space program eventually does comes on line. Thus, while airports are a major cause of congestion today, as more capacity is provided in the air through the new Airspace Program, the airport shortfalls will grow dramatically as the bottleneck of civil aviation delays and prospective safety problems, both in the short and long term.

This situation is critical and must be addressed by Congress now. What is needed are airport R&D funds.

There exists today a number of technological concepts which can be introduced in the short term to enhance immediate airport capacity. There are also various technological concepts that exist to provide larger increases in airport capacity in the longer term.

A number of these concepts have evolved from the Industry Task Force on Airport Capacity Improvement and Delayed Reduction, assembled by the FAA in 1982, which presented its first report to FAA on September 29, 1982. Since that time the task force has held numerous meetings further refining its airport capacity improvement recommendations for the FAA.

The FAA, through Administrator Engen, has been very supportive and generously active in this task force effort. But because of minuscule R&D funds for airports, progress has been tortuously slow.

This crying need deserves and demands Congress' immediate attention. On behalf of the task force and its members, who constitute a cross-section of all major segments of the industry, we ask for your support and action to provide the necessary R&D funds for the programs described in this statement. And we are not asking for funds that do not exist. We ask for funding from the $3 billion-plus uncommitted aviation trust fund surplus that already exists and is lying fallow.

These funds are needed to further research, simulate, demonstrate and implement the industry agreed to task force recommendations, including the need for high accuracy radar sensors and computer needs associated with the recommendations.

These task force concepts will produce high payoff in providing the absolutely needed increased airport capacity and safety needs of the 1980's and 1990's. Without the funding of these needs the relative chaos we experience today at many of our major airports will spread dramatically, compromising the Nation's civil aviation system and impacting safety.

Total aircraft operations at the top 39 U.S. airports are forecast by FAA to rise by one-third in the 1980's and, assuming no change in the existing capacity of these sites, average delay per operation may grow by as much as 47 percent.

Valuing delay at 1980 unit costs and extrapolating to a total system basis, air carrier delays would have an upper bound cost of $2.7 billion per year by 1991. The combined effect of increased operations and increased average delay could be to increase systemwide air carrier delays up to 39 percent.

Forecasts by FAA indicate that the number of airports with severe airside congestion alone will increase from 20 in 1986, to 41 in 1990, to over 90 major airports by the year 2000, only 14 years

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away. While the task force continues to further develop and cost out various airport capacity improvement concepts, we have displayed in our report a number of specific concepts Reduced aircraft longitudinal separation to increase the number of aircraft that can arrive in an airport during an hour; second, independent parallel IFR approaches that reduce spacing, which means reducing the distance between parallel runways from 4,300 feet down to as low as possibly 3,000 feet, thus permitting many more airports to put runways on already existing airport property.

Third, independent IFR approaches to covering runways, a new concept that can be used at as many as 100 airports in the United States. The use and introduction of better short runways to take GA and commuter traffic, and also the concept of getting into triple parallels more closely spaced. We need R&D funds for data research to undertake data collection research on pilot reactions to possible missed approaches on closely spaced parallels or triples.

We have to get into, with much more R&D money, both terminal and airport automation. We feel it is probably one of the only ways for dramatic increases in the near term, as well as the long term, in increasing airport capacity. As the seventh item on page 6 notes, we need a lot of money up front here for computer modeling. The FAA already has funds that it has swept together to implement the ADSIM computer model which addresses detailed airfield capacity options, but we are looking for money for the two other major computer programs which FAA has undertaken, the SIMMOD and the Joline airport machine, which is a privately operated computer program.

Under item 8 we note that we need some $30,000 to begin with this year, increasing to $610,000 in the outyears for the local airport capacity task force which is where the generalized concepts are then brought down to the local level and implemented in the best fashion based on the local runway configuration and the mix of traffic.

In conclusion, Mr. Chairman, I would like to briefly note that the 10 basic programs, all of which are major and can add dramatically to both short-term and long-term airport capacity, will cost in R&D estimates, about $5 million in 1986, extending out to about $19 million in the year 1989.

I would like for you to recognize that these moneys are not only for the R&D, but also include various moneys for the actual purchase of various highly developed and new sensor radars, as well as for the computer programs to make this whole system work.

Mr. Chairman, in concluding, I request your urgent attention to this pressing R&D need, and the action of this committee to help provide the airport R&D funds requested. Such adequate funding must be provided through a new and separate airport R&D FAA budget line item in order to protect the use of these important funds for the true purposes intended.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Reilly follows:]

AIRPORT OPERATORS COUNCIL INTERNATIONAL

TESTIMONY OF THE

AIRPORT OPERATORS COUNCIL INTERNATIONAL

ON THE

FISCAL YEAR 1987 FAA BUDGET REQUEST

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

April 22, 1986

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STATEMENT OF THE AIRPORT OPERATORS COUNCIL INTERNATIONAL BEFORE THE HOUSE SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

Mr. Chairman and Members of the Subcommittee:

I am J. Donald Reilly, Executive Director of the Airport Operators Council International. I am pleased to be here today to express AOCI's great concern over the grave situation facing the nation's airport and airways system. The on-going problem of underfunding for development of the airport and airways system is now compounded by the stark reality of more drastic budget cuts mandated by the Gramm-Rudman-Hollings law and reflected in the administration's FY 87 budget request. This situation bodes ill for the safety of our national aviation system and the development of airport capacity needed to meet the growing demands on the national system.

In 1982, aviation users were told by Congress and the administration that if they agreed to pay increased levels of taxes to a federal Airport and Airway Trust Fund, they would be assured of specific and dedicated expenditures for airport and aviation facility improvements that all agreed were necessary. As we all know, the Congressionally authorized levels that were established for the Airport Improvement Program at that time have never been met throughout the existence of the program, and significant underfunding has occurred in the Facilities & Equipment and Research, Engineering & Development programs as well. Congress and the administration have failed to live up to the commitment made to the aviation users and industry.

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Airport Improvement Program FY 86 Reductions

Since the inception of the Airport Improvement Program, funding levels have already fallen $360 million short of the fully authorized levels. In addition to the historical underfunding of the program, AIP was reduced by an additional $40 million for the balance of FY 86 because of Gramm Rudman Hollings. Funding for the airport grants program was cut back by 9 percent from the $1.017 billion authorized in the FY 86 Continuing Resolution, leaving $925 million, the same level as in FY 85. Then, on March 1 of this year, that level was further reduced by 4.3% to $885 million as a result of Gramm-Rudman-Hollings. The brunt of those cuts will be felt in the discretionary program, which will suffer a 17% reduction, from approximately $129.4 million to $106.6 million. Cuts of this magnitude will seriously jeopardize needed safety and capacity projects at many airports.

Additional FY 86 AIP Cuts For FAA Supplemental

Now airports are faced with another reduction in AIP grants of $43.7 million which DOT intends to use to cover over half of its supplemental funding request for FAA operations expenses. FAA has informed airport sponsors that 4.9% of their FY 86 entitlement funds will be withdrawn in anticipation of Congressional authority to transfer those monies in the Supplemental Appropriations bill. If Congress approves this reduction and transfer, the airport program will suffer a greater cut than it has already under Gramm-Rudman, while other DOT/FAA programs escape further reductions. Airports are willing to contribute their fair share towards reducing federal deficits, but I submit that we have already paid our dues in each and every appropriation that has cut back the AIP program expenditures. The airport program is paying far more than its fair share under Gramm-Rudman. While we recognize the serious budget constraints facing FAA and the need for supplemental funding it is inappropriate and ill-advised to take monies from AIP -- which may jeopardize important airport safety and capacity projects offering long-term system benefits -- in order to reduce the budget impact on FAA operations, 75 percent of which are personnel costs. AOCI strongly objects to this transfer and urges Congress not to authorize it. The House Appropriations Committee has taken the proper action in approving the FAA's supplemental request but with new money, rather than from the already constrained AIP program.

Administration's FY 87 Budget Request

As serious as the reductions for FY 86 are, it appears that airports face even deeper problems for the administration's fiscal year 1987 budget would further decimate the Airport Improvement Program. The $712.5 million request for AIP would fall $305 million short of the authorized level for FY 87, leaving the five-year AIP program underfunded by over $665 million. It would represent a 23% reduction from the $925 million funding level provided in the Continuing Resolution for FY 86.

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The entitlement program, by formula, would be cut 20% in FY 87 to $356 million, while discretionary funds would suffer a 36% reduction to $83.3 million.

The F&E and R,E & D budgets would be reduced in the administration's request to 30 percent below their authorized levels. Such cuts could have serious consequences on the National Airspace System modernization plan, and R & D essential to airport and airspace capacity and safety improvements.

The administration's FY 87 budget would further erode public confidence in the Aviation Trust Fund by taking some $2.1 billion from the capital program accounts in FY 87 to help cover FAA operations and maintenance costs. Aviation users would thus shoulder the greatest share of FAA operation expenses and witness their user taxes being diverted from the purposes for which they were dedicated. Because Congress and the administration have seen fit to arbitrarily reduce user tax spending for capital development needs over the years, and have thus allowed obscene surpluses to accumulate in the Trust Fund, those funds would now be diverted to unintended purposes. AOCI strongly opposes such misuse of the Trust Fund. We also oppose the administration's attempt to eliminate interest payments to the Trust Fund which have been earned on its balance, and to eliminate the "penalty provisions" which tie Trust Fund spending for operations to capital spending levels.

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Aviation Trust Fund Must Be Taken "Off-Budget"

While we would all agree that every effort should be made to assure that safety is not compromised, it is ludicrous that we find ourselves in the situation where the airport program is being "cannibalized" by DOT, when the resources necessary to fully meet aviation and airport needs are available in the Aviation Trust Fund. The level of aviation user taxes is not the problem; they are contributing fully sufficient funds for the Trust Fund. The dedicated user taxes generate some $4 billion a year for the Trust Fund, and the Trust Fund surplus has been allowed to grow steadily. At the end of fiscal year 1985, the Trust Fund had accumulated a cash balance of $7.7 billion and an unobligated cash balance of $3.3 billion -- and it is still growing. Trust Fund programs are fully self-financing and have contributed not one cent to the federal deficit. Yet the surplus has become a tool for federal deficit reduction purposes.

The need is there, the money is there, but what is lacking is the federal government's resolve to spend Trust Fund monies and fully fund its programs. AOCI supports continuing the user tax levels if Trust Fund monies are spent for their intended purpose. The only way we believe this can be assured is by recognizing that Trust Fund programs do not contribute to the deficit and by removing the Trust Fund from the unified federal budget. Further, these programs must be protected from the inappropriate and unacceptable Gramm-Rudman reductions. This action is absolutely essential to restore the integrity of the Trust Fund and assure full funding of the vital aviation programs for which user taxes have been dedicated.

Airport Development Critical to Airspace Expansion

The need for expanded airport facilities for safety and capacity has been well recognized. The FAA's National Plan of Integrated Airport Systems (NPIAS) projected AIP-eligible development needs for commercial service airports of $12.3 billion for the ten-year period 1984 - 1993, of which about $6 billion will be needed to enhance system capacity. AOCI estimates that total development costs at these airports is close to $27 billion over that same period. AOCI's own survey for the five years from 1986-1990 reveals capital development needs of $19.4 billion. The AIP program plays a critical role in airport development and contributes about $1 for every $3 of eligible airport safety and capacity capital financing. To fully meet needs of such magnitude over the next five years will require nearly $1.3 billion in federal grants annually.

The federal commitment to modernize and expand the national airspace and navigation system makes it critically important that airport development needs be met concomitantly. Development and expansion of the airspace and airport systems must go hand in hand. The nation can forget about using its expanded airspace system unless adequate resources are made available to increase airport capacity. Airports can barely handle today's air traffic demand -- as evidenced by the growing number of

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airports operating at or above capacity limits -- and the FAA projects passenger enplanements (air carrier and commuter) will increase dramatically from 400 million currently to over 700 million by 1997. The inextricable problems of aviation safety and capacity will only be compounded by underfunding of the airport program. The importance of safe and adequate airport facilities should not be underestimated; they are a critical link in the overall air transportation network.

Airport Research & Development Needs

Finally, we urge this Subcommittee and the Congress to give immediate attention to the Research and Development funding needs for airport capacity enhancement. The testimony of the Industry Task Force on Airport Capacity Improvement and Delay Reduction identifies many R & D projects which are essential for short and long-term capacity improvements. It is critically important that funding be provided for those projects in order to assure that airport capacity keeps pace with airspace capacity.

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TESTIMONY BY

J. Donald Reilly, Chairman
of the

INDUSTRY TASK FORCE ON AIRPORT CAPACITY IMPROVEMENT AND DELAY REDUCTION

on the

FISCAL YEAR 1987 FAA Research, Engineering
and Development Budget Request

before the

Subcommittee on Transportation,
Aviation and Materials

House Committee on Science and Technology

April 22, 1986

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A lack of airport capacity is the root-source of today's aviation congestion problems. This will become even more evident as the national air space program comes on line. Thus, while airports are a major cause of congestion today... as more capacity is provided in the air through the new air space program... the airport short falls will grow dramatically as the bottleneck of civil aviation delays and prospective safety problems, both in the short and long term.

This situation is critical and must be addressed by Congress now. What is needed are airport R and D funds.

There exist today a number of technological concepts which can be introduced in the short term to enhance immediate airport capacity. There are also various technological concepts that exist to provide larger increases in airport capacity in the longer term.

A number of these concepts have evolved from an Industry Task Force on Airport Capacity Improvement and Delay Reduction, assembled by FAA in 1982, and which presented its first report to FAA on September 29, 1982. Since that time the Industry Task Force has held numerous meetings further refining its airport capacity improvement recommendations for the FAA.

The FAA, through Administrator Engen, has been very supportive and generously active in this Task Force effort. But because of miniscule R and D funds for airports, progress has been tortuously slow.

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This crying need deserves -- and demands -- Congress' immediate attention. On behalf of the Task Force and its members, who constitute a cross-section of all major segments of the industry, we ask for your support and action to provide the necessary R & D funds for the programs described in this statement. And we are not asking for funds that do not exist. We ask for funding from the three-billion-dollar-plus uncommitted aviation trust fund surplus that already exists and is lying fallow.

These funds are needed to further research, simulate, demonstrate and implement the industry agreed to Task Force recommendations, including high accuracy radar sensors and computer needs associated with the recommendations.

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Total aircraft operations at the top thirty nine U.S. airports are forecast by FAA to rise by one-third in the 1980s and, assuming no change in the existing capacity of these sites, average delay per operation may grow by as much as 47 percent.

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Valuing delay at 1980 unit costs and extrapolating to a total system basis, air carrier delays would have an upper bound cost of $2.7 billion per year by 1991. The combined effect of increased operations and increased average delay could be to increase systemwide air carrier delays up to 39 percent.

Eleven of the top 39 airports are constrained according to FAA forecasts and eight additional airports have high projected ratios of use-to-capacity. Congestion as these 19 airports -- which account for over 51 percent of air carrier enplanements -- could, alone, degrade the overall capacity of the national transportation system according to existing FAA projections.

The number of aircraft operations are forecast to grow from 134 million in 1980 to 290 million by the year 2000, a 116 percent increase.

Domestic enplanements are forecast to increase for air carriers from 278 million in 1980 to 590 million in 2000, a 112 percent increase; while over the same period the number of commuter passengers will grow from 13 million to 42 million, a 220 percent increase.

Between the year 1980 and 2000 the air carrier fleet will increase from 2,400 to 3,400 (42 percent), the commuter fleet from 1,600 to 4,500 (175 percent), and the number of general aviation aircraft from 210,300 to 408,500 (94 percent).

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Forecasts by FAA indicate that the number of airports with severe airside congestion, alone, will be as follows:

Year	Air Carrier	Commuter	Reliever	General Aviation	Total
1981	8	--	3	--	11
1985	11	1	7	--	19
1990	23	5	11	2	41
2000	46	9	29	7	91

While the Task Force continues to further develop and cost-out various concepts ,the following are immediate, documented airport R and D funding needs:

1. Reduced Aircraft Longitudinal Separation

To safely reduce spacing between aircraft in-trial while approaching to land. Dependent on airport flow and configuration this can add one to six flights per hour.

FY 86	FY 87	FY 88	FY 89
150,000	160,000	170,000	180,000

2. Independent Parallel IFR Approaches at Reduced Spacing

With today's technology it is possible to safely reduce spacing between parallel runways from the current 4,300 feet to as low as 3,000 feet, thus providing airports the opportunity to construct new runways on present airports. The spacing and purchase of an appropriate radar with higher revolve is imperative to early implementation of this program.

FY 86	FY 87	FY 88	FY 89
1,000,000	8,000,000	8,000,000	8,000,000

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3. Independent IFR Approaches to Converging Runways

Many airports will benefit from the introduction of independent aircraft operations to existing converging runways. Effort is needed to develop the procedures, establish the requirements and validate the methods for enhanced operating minimums.

FY 86	FY 87	FY 88	FY 89
300,000	300,000	4,000,000	4,000,000

4. Use of Short Runways and Triple Parallels

In order to conduct FAA analysis of optimum application of Mode S, MLS and sensor technologies to introduce shorts and triples for enhanced airport capacity.

FY 86	FY 87	FY 88	FY 89
200,000	--	--	--

5. Data Research

To undertake data collection research on pilot reaction to missed approaches for establishing procedures for closely spaced parallels and converging runway operations.

FY 86	FY 87	FY 88	FY 89
500,000	250,000	--	--

6. Terminal and Airport Automation

To undertake parametric studies to establish optimum methods of terminal and airport automation.

FY 86	FY 87	FY 88	FY 89
300,000	300,000	--	--

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7. Computer Modeling

While the FAA is providing funds to upgrade the ADSIM computer model which addresses detailed airfield capacity options, funding is needed for:

SIMMOD - an airport air space computer model which analyses air space options to enhance capacity.

FY 86	FY 87	FY 88	FY 89
305,000	--	--	--

Joline "Airport Machine" - an airport display computer which provides quick "first-look" evaluations of specific airport capacity options.

FY 86	FY 87	FY 88	FY 89
950,000	860,000	690,000	720,000

8. Local Airport Capacity Task Forces

Funding to support the cost of local airport capacity task force (FAA, airport, and local aviation users) to examine, evaluate and introduce local capacity enhancements after computer simulations, at an average cost of $160,000 per airport.

FY 86	FY 87	FY 88	FY 89
30,000	610,000	610,000	610,000

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9. Funds to Support Task Force Applications

As important as the development and FAA approval of Task Force recommendations are the analytical studies for airport site specific application of the various capacity enhancement techniques.

FY 86	FY 87	FY 88	FY 89
1,000,000	1,000,000	1,000,000	1,000,000

10. Airport Pavement R & D

Airport runway outages account for some 20% of total delays. There are about 650 million square yards of pavement at U.S. airports representing a replacement value estimated at $100 billion. Yet there is no R & D for maintaining and improving the existing facilities and supporting research to reduce or resolve problems contributing to runway construction delays at congested airports. FAA must undertake a long-term airport R & D program for improved runway pavement technology, materials and construction techniques, control of snow and ice, improving operational capabilities under low visibility, airport lighting systems, airport system controls, wind-sheer, etc.

FY 86	FY 87	FY 88	FY 89
1,000,000	5,000,000	5,000,000	5,000,000

11. Total Airport R & D Funding Needs

FY 86	FY 87	FY 88	FY 89
5,835,000	15,480,000	19,470,000	19,510,000

Mr. Chairman, in concluding, I request your urgent attention to this pressing need, and the action of this Committee to help provide the airport R & D funds required. Such adequate funding must be provided through a new and separate "Airport R & D" FAA budget line item in order to protect the use of these important funds for the purpose intended.

Mr. **Brown**. Thank you, Mr. Reilly. That is a very strong statement.

Mr. Cooke, do you want to go next?

Mr. **Cooke**. Yes, sir, if you prefer. First of all, I would like to strongly support the recommendations by Mr. Reilly on behalf of the industry capacity task force. Our association is a member of the task force, and we fully support those recommendations for research and development. By way of reminder, NBAA represents the aviation interests of companies which own and operate airplanes and other aircraft to fulfill their daily business transportation needs. Since our member companies use their aircraft as transportation tools, any impact on the ability of American businesses to safely and efficiently use the Nation's system of air commerce is of great concern to us.

With your permission, I will excerpt from my statement and not read the whole thing.

Mr. **Brown**. We appreciate that. Your full statement will appear in the record.

Mr. **Cooke**. Thank you, sir.

Mr. **Brown**. You can just hit the high points, if you wish.

Mr. **Cooke**. If I may, yes, sir.

The association and its members strongly supported the 1982 act and accompanying tax legislation because of a threefold promise of expanded capacity, increased safety and enhanced efficiency in the airspace and at the airports. Instead the 1982 act has not fulfilled its promise, and indeed has not been allowed by Congress or the administration to fulfill its promise.

The results of a failure of Congress and the administration to fulfill the commitments made in 1982 has been to delay the implementation of numerous system capacity enhancements, while deferring expenditures to later years in some cases possibly into the next century. Further, an uncommitted balance of something in excess of $3½ billion has built up in the trust fund, an amount many feel is being held hostage to make the dismal Federal deficit appear slightly better.

Now, with respect to the NAS plan, we believe that the NAS remains a viable means by which to remedy the problems resulting from continuing to operate more and more new and modern airplanes in a system which is still saddled with equipment that dates back as far as the 1950's. We feel that we are at a crossroads now, and the choices are to continue to live with a constrained outdated air traffic control system or to finally implement plans to expand its capacity and ability to allowed anticipated air traffic growth well into the next century.

Merely to say that the administration's fiscal year 1986 budget request was inadequate, and that the fiscal year 1987 request is a continuation of that inadequacy is to stretch the bounds of understatement. Certainly, many other accurate descriptions of these budgets would be overlooked. As noted above and earlier said, Congress and the administration have simply failed to live up to the commitments made to the users which resulted in the 1982 act.

In fiscal year 1987, the administration proposes funding the Airport Improvement Program at $712½ million, the Facilities and Equipment Program at $825 million, and the Research Engineering and Development Programs at $134½ million. These proposed levels would, if enacted, result in fiscal year 1987 underfunding of $702 million. Our view is that these levels simply do not support the objectives and needs of the NASP, nor of the users who are paying for the improvements.

We are convinced the viability of the airport and airways trust fund and all trust funds designed to fund specific programs are in jeopardy as a result of budget constraints. The root cause of the problems and the delays confronting the National System of Air Commerce is the application of budget constraints to a dedicated funding mechanism which is not now, nor ever has been, in a state of imbalance. The persistence of the administration and Congress in requiring users to pay for system improvements, and then not spending the funds for the purposes intended, has resulted in a bewildering patchwork of broken promises, unfunded needs, and artificially imposed operational constraints. This chain of events must be broken, and broken immediately.

Toward this end, we fully support and urge expeditious enactment of legislation to remove the trust fund and its programs from the unified budget. We pledge our active support and would ask the committee member's support to both H.R. 4191 and Senate bill 1979. Finally, we urge Congress to reject the administration's fiscal year 1987 budget proposal regarding the FAA.

It is a shortsighted proposal and one which places more emphasis on enforcing the use of revenues dedicated to system improvements to make up for shortfalls in administrative expenses and in other agencies than it does on fulfillment of the twin objectives of enhancing capacity and efficiency.

Mr. Chairman, thank you very much for the opportunity to present this statement, and I will be glad to take any questions you have later.

[The prepared statement of Mr. Cooke follows:]

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STATEMENT
OF THE
NATIONAL BUSINESS AIRCRAFT ASSOCIATION, INC.,
BEFORE THE
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS,
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
ON THE SUBJECT OF
THE STATUS OF THE
NATIONAL AIRSPACE SYSTEM PLAN
APRIL 22, 1986

Appearing for NBAA:

Mr. Robert A. Cooke
Vice President,
Operations

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NATIONAL
BUSINESS AIRCRAFT
ASSOCIATION, INC.

Mr. Chairman and Members of the Subcommittee:

Thank you for allowing the National Business Aircraft Association, Inc. (NBAA) to present this statement on the status of the National Airspace System Plan (NASP) and the future of attempts to modernize the nation's airport and airway system. As you know, no discussion of these issues can be undertaken without considering the impact of prior year budget cuts, of the Balanced Budget and Emergency Deficit Control Act of 1985, commonly known as Gramm-Rudman-Hollings (GRH), and the President's Fiscal Year 1987 budget proposal for the Federal Aviation Administration (FAA).

NBAA represents the aviation interests of thousands of companies which own and operate aircraft to fulfill their daily business transportation needs. Since our Member Companies use their aircraft as transportation tools, any impact on the ability of American business to safely and efficiently use the nation's system of air commerce is of great concern to us.

OVERVIEW OF THE NATIONAL AIRSPACE SYSTEM PLAN

The impact of budget constraints on aviation has had two facets. The first facet is the negative effect on the everyday operation of the air traffic control system and the ancillary functions of the FAA which support it. The second but no less important facet is severe underfunding of the required substantial investments in our nation's aviation infrastructure: airports and heliports and navigation aids and surveillance systems.

As the Subcommittee is aware, the FAA is currently operating under the provisions of the Airport and Airway Improvement Act of 1982 (the 1982 Act).

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This law and its amendments authorize some $12.685 billion to be spent from the Airport and Airways Trust Fund through FY 1987 for airport improvement, research, development and engineering and the upgrading of air navigation facilities and equipment pursuant to the NASP. Additionally, the FAA is authorized to draw $8.234 billion from the Trust Fund to pay a portion of its Operations and Maintenance expenses. This "contribution" represents what has been termed the users' share of the cost of operating the airport and airway system and the FAA. Funding for the NASP is derived from a measure accompanying the 1982 Act which levies sharply increased Federal excise taxes on non-commercial aviation fuel, air freight and the transportation of persons by air, commonly known as the "ticket tax" but applicable to all commercial air transportation of persons.

NBAA and its membership supported the 1982 Act and accompanying tax legislation because of their three-fold promise of expanded capacity, increased safety and enhanced efficiency in the airspace and at the airport. Instead, the 1982 Act has not fulfilled its promise, indeed, has not been allowed by Congress and the Administration to fulfill its promise. As evidence we offer the record system delays encountered during the summer and fall of 1984, when demand for air transportation outstripped the system's ability to accomodate users. Further evidence can be found by examining the restrictions in existence at certain "high traffic density airports", at which operators are required to obtain reservations or "slots" to land or take off solely because the airports' operators have not adequately planned for the amount of traffic now using them or properly used the millions of dollars in airport grants they have received over the years to enhance capacity.

The result of the failure of Congress and the Administration to fulfill the commitments made in 1982 has been to delay the implementation date of numerous system enhancements while deferring expenditures to later years, in some cases possibly into the next century. Further, an uncommitted balance of more than $3.5 billion has built up in the Trust Fund, an amount many feel is being "held hostage" to make a dismal Federal deficit appear slightly better. These reductions in funding, coupled with the cuts contained in the President's FY 1987 budget proposal, will combine to reduce authorized spending on FAA capital development programs since 1982 by as much as $2.3 billion by the 1982 Act's expiration date of October 1, 1987.

Due to these reductions in funding and the possibility of further cuts as a result of GRH, each component of the NASP has been and, in all probability will continue to be, subject to delayed implementation. These delays only increase costs: costs to users through inefficiencies in the system and to the Federal government as the costs of operating an aging air traffic control system continue to rise. Of course, as delays continue, the out-year costs for eventual installation of modernized equipment will also increase.

VIABILITY OF THE NASP PLAN

We believe the NASP remains a viable means by which to remedy the myriad problems resulting from continuing to operate aircraft of the 1980's in an air traffic control system saddled with equipment from the 1950's.

However, if and only if immediate changes are made in the priorities at the Office of Management and Budget, the Secretary of Transportation and the Budget and Appropriations Committees of both houses of Congress will the viability of the NASP be preserved. Absent such changes, the promise of the NASP simply will not be fulfilled.

Simply put, we are at a crossroad. The choices are to continue to live with a constrained, outdated air traffic control system or to, finally, implement plans to expand its capacity and its ability to allow anticipated air traffic growth well into the next century. Also at risk is the continued support of the aviation community for the FAA, the Trust Fund and the NASP.

FISCAL YEAR 1986/1987 BUDGET REQUESTS

To merely say that the Administration's FY 1986 budget request was inadequate, and that the FY 1987 request is a continuation of that inadequacy, is to stretch the bounds of understatement. Certainly, many other accurate descriptions of these budgets would be overlooked. As noted above, the Congress and the Administration have simply failed to live up to the commitments made to users which resulted in the 1982 Act.

In FY 1986, Congress enacted FAA's appropriations through the Continuing Resolution. After application of the March 1, 1986, sequestrations under GRH, FAA's capital development programs were underfunded by $591.6 million. This figure represents the annual authorization only -- not the cumulative authorization contained in the 1982 Act. If the cumulative authorization method is used, total underfunding at the end of FY 1986 would

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total $1.6583 billion. If these funds were derived from the general treasury, perhaps this degree of shortfall would be understandable. However, that is not the case. These funds are dedicated to aviation capital development and are derived from taxes specifically levied for these purposes.

In FY 1987, the Administration has proposed funding the Airport Improvement Program at $712.5 million, the Facilities and Equipment program at $825 million and the Research Engineering and Development program at only 134.5 million. These proposed levels would, if enacted, result in FY 1987 underfunding of $702.2 million.

In our view, these funding levels simply do not support the objectives and needs of the NASP nor of users who are paying for these improvements. Already, numerous programs of the NASP have been subjected to delay and stretch-out. The FAA's full-funding concept will likely have to be abandoned, increasing the cost of the eventual equipment and costs to the users through higher taxes for longer periods of time and through continued inefficiency at the airport and in the airspace. Simply put, the President's FY 1987 budget proposal for FAA should be abandoned.

STATUS OF THE ADVANCED AUTOMATION SYSTEM (AAS)

As the Subcommittee is aware, the General Accounting Office (GAO) recently released an interim report (IMTEC-85-11) on the status of the AAS. The GAO identified various aspects of the program it concluded were shortcomings. Generally, we disagree with GAO on their estimations of the

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ramifications of programs and activities related to aviation. This instance is no exception.

In its report, GAO noted shortcomings in the FAA's plans for developmental testing prior to procurement and installation of AAS. Further, GAO found certain planned tests had not been conducted.

NBAA fully supports the AAS procurement and urges its expeditious installation. We note that the above-referenced GAO report is somewhat dated and that the AAS project is one which has been subject to delays in development, brought about through inadequate funding. Consequently, we urge that this issue be revisited by GAO, the FAA and this Subcommittee. We are certain that a re-evaluation of this program and its status will result in alleviation of many of the concerns expressed by GAO, whatever their merit.

THE AIRPORT AND AIRWAYS TRUST FUND

We are convinced the viability of the Airport and Airways Trust Fund, and all trust funds designed to fund specific programs, are in jeopardy as a result of budget constraints. As a funding mechanism alone, a trust fund combines the twin concepts that beneficiaries of certain programs should pay for them and that the funds derived from users should only be spent on such programs. Sadly, these concepts are being sorely tested as Congress and the Administration continue to fail to use these funds for the purposes originally and publicly intended. Simply put, Congress must act soon to end this "shell game" of taxes, budget constraints, stretched-out funding and bloated Trust Fund balances.

This is especially important as Congress awaits the Administration's proposals for re-authorization of the expiring 1982 Act. Legislation re-authorizing these programs, user taxes and the Trust Fund must include mechanisms to protect the interests of users in receiving the benefits for which they are paying, remove the Trust Fund from the vagaries of the Federal budget process and provide incentives for the Federal government to provide funding for these programs against competitive ones. Without such amendments, the next authorization may simply not gain the support of the user community.

RECOMMENDATIONS

The root cause of the problems and delays confronting the national system of air commerce is the application of budget constraints to a dedicated funding mechanism which is not now nor has ever been in a state of imbalance. The persistence of the Administration and Congress in requiring users to pay for system improvements and then not spending the funds for the purposes intended has resulted in a bewildering patchwork of broken promises, unfunded needs and artificially-imposed operational constraints. This chain of events must be broken and broken immediately.

Toward this end, we fully support and urge expeditious enactment of legislation to remove the Trust Fund and its programs from the unified budget. We pledge our active support to both H.R. 4191 and S. 1979. Should these bills fail to free the FAA and its programs from the short-sighted constraints imposed by GRH, legislation specifically exempting FAA from the process should be enacted.

Additionally, the future of the NASP and the realization of expanded capacity and efficiency in the airspace is endangered. Consequently, this Subcommittee and Congress as a whole should begin the process of developing legislation to re-authorize the expiring 1982 Act, perhaps well before the September 30, 1987, deadline.

Finally, we urge Congress to reject the Administration's FY 1987 budget proposal regarding the FAA. It is a short-sighted proposal and one which places more emphasis on forcing the use of revenues dedicated to system improvement to make up for shortfalls in administrative expenses and in other agencies than it does on fulfillment of the twin objectives of enhancing capacity and efficiency. It is simply the wrong budget for the times and can only achieve its objectives through amendment of existing statutes allowing the Administration to pull from the Trust Fund for the FAA's FY 1987 administrative expenses much more money than authorized.

CONCLUSION

In sum, the application of further budget cuts and sequestrations as a result of GRH could not have come at a worse time for aviation. In FY 1986 alone, millions of users' dollars previously planned for and appropriated by Congress will not be spent to alleviate existing system requirements. Through the life of GRH, untold billions of dollars will be kept from fulfilling the goals and promises for which they were collected from users. The Congress and the Administration must take immediate steps to forestall the drastic, supposedly unintended, effect of these cuts on aviation programs. Without such steps, the approximately 550 million air travelers

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each year will find that the resulting system simply cannot support the demand. Anyone who depends on air commerce, such as the banking industry, to move cancelled checks from bank to bank, businesses using small package express services, the Postal Service, the tourism industry and even the military, which uses civilian aviation facilities when operating domestically, will be adversely affected. We can only speculate on the damage to the overall economy and, consequently, to the very effort to balance the Federal budget from which these problems derive.

The future of the FAA, its capital development programs and aviation in general is not a bright one as a result of GRH and the President's proposed FY 1987 budget. We are hopeful that thoughtful, reasoned actions will prevail and that all in aviation can get on about building, expanding and benefiting from the safest, most efficient system of air transportation ever devised.

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Mr. BROWN. Mr. Fleming, do you want to present your statement?

Mr. FLEMING. Thank you, Mr. Chairman. I understand the full statement will be presented in the record, and I will merely summarize.

Mr. BROWN. Correct.

Mr. FLEMING. Thank you. I am pleased to appear before you today on behalf of the ATA members to offer our views on the fiscal year 1987 FAA research, engineering and development budget request, the National Airspace System plan and related issues and to seek this committee's support of actions that will assure the continued safety, high quality and convenience of air transportation.

ATA members have consistently supported the modernization of the air traffic control system and the NAS plan. It is our strong view that the administration's 1987 budget request is simply inadequate to meet the clearly established airport and airway needs of this country. In the FAA budget request for 1987, aviation faces the disturbing combination of an enormous trust fund surplus while there are substantial unmet system development and operating needs. The uncommitted trust fund surplus now estimated at over $3.3 billion is growing faster than ever before in its history, and is expected to reach approximately $4.3 billion by October of this year.

Review of FAA's most recent addition of the NAS plan, which was published in 1985, and comparison of that plan to the original NAS plan of 1981 shows that important aviation safety and capacity improvements have already been delayed, notwithstanding the fact that expenditures for such improvements are entirely supported by taxes paid exclusively by users of the aviation system.

As you know, increasing concern is being expressed by members of Congress and others about this distressing and intolerable situation. Now, in addition, damaging cuts in F&E, RE&D and AI spending are requested by the administration for fiscal year 1987. The administration's budget request for FAA is predicated on total budget targets established in Gramm-Rudman-Hollings which bear little relationship to aviation trust fund resources or what is required to ensure safe efficient aviation system. Enactment of the administration's 1987 budget request would compromise air traffic control system monitorization and airport capacity improvements, as Mr. Reilly has so eloquently stated.

Since 1982, FAA's NAS Program expenditures have fallen short of authorized levels by about $1½ billion compared to authorized levels. The administration's budget request would result in program cuts of another $700 million bringing the total shortfall to $2.2 billion over the 5-year legislation life. It is widely recognized that the national airspace system must be modernized for it to meet the operational and capacity challenges of the future.

As I noted, we supported the NAS plan when it was announced. We supported the establishment of tax and spending levels adequate to implement it on a timely basis, and we continue to support NAS modernization. However, we are increasingly concerned about potential slippages in the implementation of major components without which safety efficiency and productivity gains for both the operators and the government would be delayed. If such major components do slip, as the fiscal year 1987 funding request envisions, the financial and technical viability of the NAS plan is clearly in question.

A major element in the NAS plan that warrants comment here is the FAA request for $72.1 million to continue the design competition phase for the advanced automation system and for engineering and design of field facilities to accept the initial sector suite system, the first major hardware acquisition under this program. The airlines strongly support the objectives of the advanced automation system to increase system safety and capacity, to improve productivity of the controller work force, and to increase economy of operation for system users.

Automation improvements to the current system are sorely needed to cope with growing demand for system services, to reduce delays currently being experienced in the system, to accommodate future growth, and to further improve the level of safety accorded the traveling public. FAA's AAS acquisition strategy has been criticized by GAO. GAO recommends a development testing phase before making an AAS production decision.

GAO also notes that House Joint Resolution 465 directed FAA to complete an updated cost-benefit analysis to be delivered to the Congress in early 1987. The ATA members believe that FAA's Advanced Automation System acquisition strategy adequately addresses the risk issues. We support the AAS Program objectives, and the ATA members also support FAA's request for $72.1 million to continue the design competition phase in fiscal year 1987.

Turning now to the RE&D budget request, FAA as already noted, has requested an appropriation of $134 million, $59 million short of the authorized level. That shortfall for 1 year's funding is nearly as much as the cumulative shortfall of $76 million which has occurred in fiscal years 1980 through 1986. We urge your support in seeking appropriation of the full authorized amount for RE&D in fiscal year 1987.

Aviation RE&D is critical to the future success of airspace modernization. Shortfalls in funding here will detrimentally affect NAS plan implementation schedules and other FAA Programs for increasing airspace and airport capacity. For example, without the essential refinement in automation technology for automated en route air traffic control, know by the acronym, AERA, terminal automation, and data link communications, the full benefit of the advanced automation system can never be realized. This phase of NAS modernization is of utmost importance if the aviation system is to expand to meet the ever increasing demand of the flying public.

The constrained 1987 budget request does not include sufficient funds needed to complete important research on FAA's TCAS system; $4.3 million is included in the RE&D request to support TCAS development, but this funding level is inadequate to complete a timely operational evaluation of several features which airlines need examined in order to make informed decisions about the best collision avoidance equipment to purchase.

Another extremely important area of concern is the critical work on explosive detection conducted under the FAA's Aviation Safety

Program. And finally, Mr. Reilly has mentioned at length on behalf of the airport capacity task force, the needed RE&D work in airport capacity. ATA serves on that task force also and strongly supports those recommendations. I have noted several of them in our statement.

In conclusion, Mr. Chairman, ATA continues to support the NAS plan and its related F&E and RE&D Programs, we believe it is essential that the airspace system be modernized to provide the necessary safety, capacity and efficiency enhancements, which are fundamental objectives of the NAS plan.

Essential safety-related work must be supported, and we urge this committee join efforts to ensure that FAA funding is provided consistent with existing authorizations and recognized needs. Mr. Chairman, I am sure the three of us are prepared now to answer your questions.

[The prepared statement of Mr. Fleming follows:]

STATEMENT BEFORE
THE SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS OF THE HOUSE SCIENCE AND TECHNOLOGY COMMITTEE

AIR TRANSPORT ASSOCIATION OF AMERICA

April 22, 1986

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Statement by J. Roger Fleming
Senior Vice President, Technical Services
Air Transport Association of America
Before the Subcommittee on Transportation,
Aviation and Materials of the
House Science and Technology Committee
April 22, 1986

Mr. Chairman, and members of the Subcommittee, I am J. Roger Fleming, Senior Vice President, Technical Services, Air Transport Association of America (ATA). ATA is pleased to appear before you today on behalf of our member airlines to offer our views on the Fiscal Year 1987 FAA Research, Engineering and Development budget request, the National Airspace System Plan and related issues, and to seek the Committee's support of actions that will assure the continued safety, high quality and convenience of air transportation.

We have consistently supported the modernization of the Air Traffic Control System and the NAS Plan. It is our strong view that the Administration's request is simply inadequate to meet the clearly established airport and airway needs of this country. Furthermore, the budget request ignores the fact that more than adequate resources are available in the user-funded Aviation Trust Fund which was created for the primary purpose of maintaining and enhancing the safety and capacity of our nation's airport and airway system. ATA has consistently urged appropriation for the various Trust Fund programs at levels consistent with current law.

In the FAA budget request for Fiscal Year 1987, aviation faces the distressing combination of an enormous Trust Fund surplus while there are substantial unmet system development and operating needs. The uncommitted Trust Fund surplus, now estimated at over $3.3 billion, is growing faster than ever before in its history, and is expected to reach $4.3 billion by October of 1986. Review of FAA's most recent edition of the NAS Plan issued in 1985, compared to the original NAS Plan published in 1981, shows that important aviation safety and capacity improvements have already been delayed, notwithstanding the fact that expenditures for such improvements are entirely supported by taxes paid exclusively by users of the aviation system. As you know, increasing concern is being expressed by members of Congress and others about this distressing and intolerable situation.

Now, in addition, damaging cuts in Facilities and Equipment (F & E), Research, Engineering and Development (R, E & D) and Airport Improvement Program (AIP) spending are requested by the Administration for Fiscal Year 1987. The Administration's budget request for FAA is predicated on total budget targets, established in Gramm-Rudman-Hollings, which bear little relationship to Aviation Trust Fund resources or what is required to ensure a safe and efficient aviation system. Enactment of the Administration's Fiscal Year 1987 budget request would compromise air traffic control system modernization and airport capacity improvements, impeding the future vitality and growth of air transportation.

The impact of Fiscal Year 1987 budget cuts under the Administration's budget request would be extremely serious. Since 1982, program expenditures have fallen short of authorized levels by about $1.5 billion compared to authorization levels. The Administration's budget request would result in program cuts of another $700 million, bringing the total shortfall to $2.2 billion over the 5-year legislation. While recommending user-tax supported programs be funded 30 percent below their authorized levels, the Administration proposes to amend the authorizing statute to permit the funding of $2.1 billion of FAA Operation and Maintenance costs from the Trust Fund.

ATA strongly opposes this proposal. The funding of FAA Operations and Maintenance from the Trust Fund at the expense of the programs on which the future of our aviation system rely is unacceptable. The inevitable result will be enormous difficulties in the future as modernization of the airspace and enhancement of airport facilities are delayed or denied. Trust Fund revenues will exceed $4 billion in Fiscal Year 1987, more than enough to fund all Trust Fund programs supporting the modernization effort at authorization levels. The need is clearly identified, and the users are providing the resources to meet the need. ATA urges this committee to support efforts seeking the appropriation of the full authorized program levels.

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National Airspace System Plan/ Facilities and Equipment

The authorization level for the Facilities and Equipment account for Fiscal Year 1987 is $1.164 billion. The Administration request of $825 million is $339 million, or 30 percent, less than the authorization level. The Administration's request is clearly inadequate. Under the budget request, progress on the NAS Plan would be slowed. Last year, FAA was able to protect major NAS Plan projects by delaying other supporting projects which have less impact on system safety and capacity. This short term expedient is no longer a viable option.

During Congressional hearings last year, FAA indicated that if critical NAS Plan programs were to be carried out on schedule, the cumulative funding deficiencies would have to be resolved,, or slippages in major program schedules were bound to occur. And now, Mr. Chairman, the FAA Administrator has publicly stated that the requested Fiscal Year 1987 budget levels will result in the abandonment of the "full funding" approach to FAA budgeting for certain projects, and the inevitable deferral into the future of major NAS Plan components.

The abandonment of full funding is detrimental to the viability of the NAS Plan. As you know, under the full funding

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approach, the total funding necessary to procure, install and commission a specific F&E item is included in the appropriation that is provided in the first year. Thus, once an item is funded in a particular fiscal year, additional appropriations are not required to complete the item and have it available in the aviation system on a timely and cost-effective basis.

The Administration has stated that $91.2 million of Fiscal Year 1987 funds previously designated to fully fund NAS Plan-related F & E items will have to be used for support of other NAS Plan projects. The items which are not fully funded will require additional appropriations in future years for completion. Future dollar needs are thereby raised, and the total cost of the NAS Plan is likely to increase. Lack of full funding can freeze a program in mid-stream, with resultant delay and waste. The anticipated benefits of NAS Plan implementation, such as reduced maintenance and personnel requirements, are thereby delayed and distorted, rendering obsolete planned maintenance schedules and personnel objectives which assumed the efficiency benefits of NAS Plan implementation. User safety and operating cost benefits will also be delayed.

The abandonment of full funding can only have negative consequences for important NAS Plan programs. For example, FAA plans to remove from full funding status in Fiscal Year 1987 such important safety programs as Terminal Doppler Weather

Radar (TDWR) and Central Weather Processing (CWP), both important for severe weather detection and alert, including low altitude wind shear hazards.

It is widely recognized that the national airspace system must be modernized for it to meet the operational and capacity challenges of the future. We supported the NAS Plan when it was announced by FAA, and we supported the establishment of tax and spending levels adequate to implement it on a timely basis. We continue to support NAS modernization. However, we grow increasingly concerned about potential slippages in the implementation of major components without which safety, efficiency and productivity gains (for both operators and the government) will be delayed. If such major components do slip, as the Fiscal Year 1987 funding request envisions, the financial and technical viability of the NAS Plan, under the present method of funding and management, is clearly in question.

A major element in the NAS Plan that warrants comment is the FAA request for $72.1 million to continue the Design Competition Phase (DCP) for the Advanced Automation System (AAS), and for architectural engineering and design of field facilities to accept the Initial Sector Suite System -- the first major hardware acquisition under this program. The airlines strongly support the objectives of the AAS: to increase ATC system safety and capacity, to improve productivity of the controller workforce, and to increase economy of operation for system users. Automation improvements to the current system are sorely needed to cope with growing demand for ATC system services, to reduce delays currently being experienced in the system, to accommodate future growth and to further improve the level of safety accorded the travelling public.

FAA's AAS acquisition strategy has been criticized by the General Accounting Office (GAO). GAO recommends a development and testing phase before making an AAS production decision. GAO also notes that House Joint Resolution 465 on Further Continuing Appropriations for Fiscal Year 1986 directed FAA to complete an updated AAS cost-benefit analysis to be delivered to the Congress in early 1987. GAO contends that this study will enable Congress to make a better informed funding decision on AAS hardware production in connection with FAA's 1988 budget request.

We believe FAA's AAS acquisition strategy adequately addresses the risk issues, we support the AAS program objectives and the ATA members support FAA's request for $72.1 million to continue the design competition phase in Fiscal Year 1987.

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Research, Engineering and Development

The Administration has requested an appropriation of $134 million for R, E & D in Fiscal Year 1987. This request is $59 million short of the authorized level of $193 million. That shortfall for one year's funding is nearly as much as the cumulative shortfall of $76 million which has occurred in Fiscal Years 1983 through 1986. We urge your support in seeking the appropriation of the full authorized amount for R, E & D in Fiscal Year 1987.

Aviation R, E & D is also critical to the future success of airspace modernization. Shortfalls in R, E & D funding will detrimentally affect NAS Plan implementation schedules and other FAA programs for increasing airspace and airport capacity, since approximately 90 percent of the R, E & D budget contributes to supporting NAS Plan implementation. For example, without the essential refinement in automation technology for automated en route air traffic control (AERA), terminal automation, and data link communications, the full benefit of the advanced automation system can never be realized. This phase of NAS modernization is of upmost importance if the aviation system can be expected to expand to meet the ever-increasing demand of the flying public.

The constrained Fiscal Year 1987 R, E & D budget request does not include sufficient funds needed to complete important

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safety research on FAA's Traffic Alert and Collision Avoidance System (TCAS). Although $4.3 million is included in the R, E & D request to support TCAS development, this funding level is inadequate to complete a timely operational evaluation of limited horizontal maneuvers as an add-on capability to the TCAS II equipment configuration. Airlines need in-service evaluation of this expanded TCAS II capability in conjunction with the Limited Implementation Program (scheduled for late 1986-88), so that sound decisions can be made on the most appropriate TCAS equipment configuration for installation in airline aircraft. An additional $9 million in R, E & D funding is needed for this purpose.

Another extremely important area of R, E & D concern is the critical work on explosives detection conducted in the FAA Aviation Safety Program. A number of promising techniques have been identified that could provide the urgently needed capabilities to effectively and efficiently detect explosives in the aviation environment. This important work must not be delayed by lack of funds, and, in fact, must be expedited and implemented as rapidly as possible.

Lastly, critical R, E & D programs designed to enhance existing airport capacity are facing curtailment for lack of funds. Specifically, these vital programs would allow simultaneous instrument approaches to more closely spaced parallel runways; allow simultaneous instrument approaches to converging runways; and narrow the required minimum separation

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of landing aircraft from the current three miles to two and one-half miles. Adoption of these procedures requires feasibility analysis and computer simulation as well as developing specifications for more precise radars. Airport capacity is a finite commodity and efforts to make the most efficient use of limited runways deserve high priority.

Trust Fund Issues

The Administration has come forward this year, as it did last year, with two controversial proposals that are inconsistent with Congressional intent, and which we strongly oppose. First, the Administration proposes to amend Sec. 506(c)(2) of the Airport and Airways Improvement Act of 1982 to permit FAA to exceed the amount of Trust Fund expenditures allowed in current law for operations. The airlines believe that basic structural changes in the authorizing legislation, as would be required by the Administration's proposal, should be deferred until the comprehensive examination that Congress will undertake when it considers airport and airway legislation.

Secondly, the Administration's budget request eliminates the crediting of interest on Trust Fund balances. We hope the Congress will insure that interest is credited to the Fund, as it has traditionally and properly been done in the past.

The reauthorization process will provide an opportunity to explore new ways of funding and operating the national airspace

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system, and to ensure that aviation programs in the future are freed from the inequities that have existed during the past 15 years. ATA is now examining whether a federal corporation would be a more efficient and financially sound way to operate, maintain and develop the air traffic control system. The possible benefits of funding airport development through a federal corporation are also being explored. By removing the airport and airway programs from the annual federal budget battles and the constraints of certain personnel, procurement and financial policies, under which the FAA must currently operate, the NAS Plan, airport improvements and the growth of the air traffic control system may well be more expeditiously and efficiently accomplished.

Conclusion

Mr. Chairman, ATA continues to support the NAS Plan and its related F & E and R, E & D programs. We believe that it is essential that the airspace system be modernized to provide the necessary safety, capacity and efficiency enhancements which are the fundamental objectives of the NAS Plan. Essential safety-related R, E & D must be supported. We urge this committee to join efforts to ensure that FAA funding is provided consistent with existing authorizations and recognized needs.

This concludes my testimony, and I would be pleased to address any questions.

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Mr. Brown. Thank you very much, Mr. Fleming.

We will start with Mr. Packard. Do you have any questions, Mr. Packard?

Mr. Packard. Thank you, Mr. Chairman. In your testimony, Mr. Reilly, you outline several categories—10, I believe—of recommendations that would center around the budget issues, and in your total, moving from almost 6, 5.8, in the 1986 budget, to 19.5 in the 1989 budget year.

How much of those funds are anticipated to be raised through your trust funds?

Mr. Reilly. Presently there is zero in the trust fund primarily due to the fact that we have absolutely no line item for airport R&D. Presently within FAA, and for understandable reasons, they are sweeping together every penny they can find just to try to take care of their airspace program, with no money left over for any other efforts.

What we are finding, though, Mr. Packard, is that airport capacity, or really the lack of airport capacity, is today the major bottleneck facing the aviation industry, and once we put on line our new airspace system, which will provide many more operations through the airspace, that will give even more focus to the lack of capacity on the ground.

What we are saying here, sir, is that we have advocated some 10 basic programs. We are looking at a number of others, but right now we have tried as best possible to cost these programs out in order to try to increase both short-term and long-term airport capacity, and we need this kind of new money in a separate line item to cover this effort. There is no other money available, sir.

Mr. Packard. Many of your recommendations and your 10 items will draw some criticism from local constituencies in regard to expansion programs, and they will base their arguments on safety and on noise abatement and other congestion problems that are now facing many airports throughout the country, so that there is general local resistance to implement some of these recommendations, particularly increasing the number of runways, paralleling of runways, shortening the distance between them, et cetera. All of these, they will argue, will reduce the safety margins.

On the other hand, the congestion and the problems of traffic at the airports is now exceeding their ability to handle it, and that also becomes a safety factor that is often overlooked by at least constituents. How do you balance that out? Do you believe that this will increase safety as well as, of course, productivity at the airports?

Mr. Reilly. Mr. Packard, representing the views of major airports around the United States, I can fully appreciate your statement, and I would like to support your statement that aircraft noise does remain one of the basic problems impacting the development of airports, as well as raising public resistance toward increase of capacity.

Mr. Packard, the program that the industry task force is advocating here are generalized concepts. We are not saying that each of these concepts should or must go into every airport. What we are saying, though, is that these new options, these capacity developments, now exist for those airports that want to implement them, for those airlines that want to increase traffic at an airport where the local community wants to increase its commerce, then let's use these systems at those airports.

We are not trying to force feed new runways or more noise on those communities that oppose it. We recognize as an industry that there has to be that finite balance, and we keep striving toward it, sir.

Mr. **PACKARD**. Mr. Fleming, if, in fact, funds are not made available for the variety of needs that have been outlined by all three of the witnesses this morning, if those funds are not made available, and of course I think all of you have recognized the considerable pressures we have on budget now, how would you prioritize the programs in terms of providing for some of the problems that you have, but not recognizing that there would be shortfalls?

Mr. **FLEMING**. Mr. Packard, I am assuming you are asking that question in the context of the RE&D budget request.

Mr. **PACKARD**. Right.

Mr. **FLEMING**. I probably would prioritize them very close to the way the FAA has done it, because it seems to me what they are trying to do here is to take near term measures, adjustments, if you will, trying to keep as much of the NAS plan going as they can. And one of the things that has happened is they have shortchanged a lot of other important needs, one of which Mr. Reilly has just spoken on again on behalf of the airport capacity task force, as well as AOCI.

It is difficult, I think, to criticize what appears in the budget request in terms of what FAA has done within the overall budget ceiling that they apparently decided they had to work within. Our problem clearly is there is not enough in the request to meet the demonstrated needs, while the users of the system, the passengers, the shippers, and general aviation are contributing moneys into the trust fund, and the funds are available.

Of course, what we desperately need, and it has already been the subject of quite a bit of discussion this morning, is some way to get those trust funds expended for the purpose intended.

Might I add one further comment on Mr. Reilly's answer to your question? One of the objectives of the airport-related research and development program is to be absolutely certain that these changes, when and if they are introduced, will not compromise safety in any way, and they won't be introduced if that would be the case. Thank you.

Mr. **PACKARD**. There are some R&D programs that have been underway for some time, and they are on some time lines that are perhaps slipping now, TCAS being a good example. If there was no further funding for such projects and R&D work on them had to be discontinued or at least delayed, do you think there is adequate confidence in those systems now to justify the airports investing in those kinds of systems—that they will implement them now instead of delay?

Mr. **FLEMING**. Let me address, if I might, the TCAS since you asked specifically about that particular system, and it is a very important one, and it serves as a good example. I have noted in my statement the need for about $9 million additional funding to complete needed R&D on that system, and I notice also in taking a quick look at Captain Howell's statement from ALPA that he will address that problem in a different way when he appears before you later today.

The TCAS system is not ready for implementation. As a matter of fact, FAA has just approved operational testing of a prototype equipment in a Piedmont Airlines Boeing 737 just within the last several weeks. That is the first stage of operational testing of an equipment that we already know does not have all of the features needed for airline operation.

There is a further operational testing step known as the limited implementation program. LIP is the FAA's acronym, and it is that program for which we would like to see the additional funding made available so that some of the advantageous features of the so-called TCAS III can be tested early on. There are minimal operational performance standards specified by RTCA already for TCAS II. There are not such standards yet for TCAS III.

We can get to TCAS II in terms of implementation much earlier than we can get to TCAS III, and we see here an advantage of testing some desirable features—horizontal maneuvering is the term you will discover Captain Howell will use—if we can get those funds made available soon. You have to remember that TCAS is a back up to the primary collision avoidance system provided by the air traffic control system, and we look to the air traffic control system to ensure that we don't have midair collisions, but the TCAS is a backup in case of human error.

We believe it is an important program. We need a relatively modest amount of money to answer the questions we need answered before airlines can make informed decisions about which equipment to buy. It would be a crying shame if we can't get that done in connection with this limited implementation program, which is scheduled for 1986 through 1988 calendar years.

We urgently hope a way can be found to do that. We have met recently with Administrator Engen, and asked that he see if there isn't some inventive way that he could find the necessary funding, and I am not very sanguine that he is going to be able to do that. He will, of course, appear before this committee tomorrow, and you might wish to ask if that were possible, Mr. Chairman.

Mr. **Packard**. We certainly—at least I personally applaud your position on the removal of the trust funds from the unified budget, and I would certainly encourage the entire industry to use their efforts in lobbying strength to try to bring that about. It is not easy to do. Some of us have been trying to get that done along with highway trust funds and other trust funds in the unified budget.

I don't have any further questions.

Mr. **Brown**. Thank you, Mr. Packard. Mr. Lewis?

Mr. **Lewis**. Thank you, Mr. Chairman.

Mr. Fleming, if the required funds for the NAS system are not appropriated, how would you prioritize the many programs?

Mr. **Fleming**. Mr. Lewis, I can't simply answer that question for this reason: the entire National Airspace System Program, with one important exception, is all interconnected in terms of its pieces. The one exception I know about is the microwave landing system. If that system were to be delayed, it is my understanding that that delay would have no impact on the remaining parts of the NAS plan, but the rest of it is all linked together, and when the important pieces, the major components start slipping, then the other pieces are going to slip along with them, and of course that inevitably is going to increase total acquisition costs and may increase acquisition risk, too. But I am not able to break down for you out of that very, very complex plan exactly which pieces should be slipped first. I think we would have to rely on the FAA to tell us how they would go about it.

Mr. LEWIS. With the possibilities of continued budget cuts over the next 4 years, 3 or 4 years, how would you recommend—or do you feel that community participation—community participation meaning cities that hold major airports or counties that have major airports should become more involved in assisting in the financing for increased and better systems such as Doppler technology installations, things of that nature?

Mr. FLEMING. Well, I think, Mr. Lewis, the answer has to be support of whatever scheme is decided is best to enable the trust funds to be made available for the purpose intended. We have spoken several times here in this room this morning about legislation to take the trust fund off the budget. You were probably aware that the Air Transport Association has sponsored a study by the National Academy of Public Administration on a Federal corporation as a possible means to effect that objective.

That study by NAPA has just recently been published, and it is under review by the ATA Board of Directors and we have attempted to keep informed Members of Congress who are interested in aviation matters, and also Members of the aviation community as this proposal unfolded. It was our belief within the ATA staff when we first recommended this possibility to our Board of Directors that a Federal corporation would have a lot of characteristics which would address the very kinds of issues that we are talking about this morning.

How do you keep a NAS plan on schedule? How do you get the research and engineering and development work done in a timely matter to support airport capacity improvements? How do you ensure that FAA's essential safety programs are kept on track? One of the key things that has to be done, of course, is to ensure adequate source of funding, and it seems to me that with the exception of the airport part of this puzzle, we are talking about what is currently done within the parameters of the FAA budget request.

Of course, our conception of the Federal corporation was a body that would operate the air traffic control system and perhaps be involved in airport development. Within ATA we had not gone further with our notion of what role that Federal corporation might play. The National Academy study, in fact, recommended a wider scope for the Federal corporation, including all of FAA, and that is a matter which is going to be subject to further study and recommendation by the ATA Board.

Now that is a rather the long-way-around response to your question, but I apologize if I overwhelmed you.

Mr. REILLY. Mr. Lewis, may I just add a short statement to that question?

Mr. LEWIS. Sure. Let me be a little bit more specific. We will take Dallas Airport as an example. If Doppler technology was at such a state that it could be installed and be useful, a useful tool for aviation, wouldn't it be prudent to ask the city of Dallas to become more involved in the financing of the installation of that system at that airport along with the FAA?

Mr. REILLY. If I may first reply to that, Mr Lewis, going back to your previous question, let me just mention that when you asked whether the local communities could put up the money for more of the National Airspace Program, I remind the committee that the people from those communities, through paying their passenger ticket taxes, have already been putting up $4 billion a year for these specific programs.

Mr. LEWIS. I'm going to get to that in a moment, Mr. Reilly, but I want you to specifically answer that question. Do you think if we set up a matching fund or we ask them to put up 25 percent of the installation costs, that this would be too much to ask for a city like Dallas or New York or Chicago or Los Angeles or San Diego?

Mr. REILLY. Mr. Fleming has asked if he could respond to that first.

Mr. FLEMING. Mr. Lewis, now that I understand that one of your more immediate concerns is Doppler weather radar for Dallas/Ft. Worth, I better understand the nature of your inquiry, and I understand the reason for it, too, very clearly.

We have been very vigorous in our support for FAA's Terminal Doppler Weather Radar Program. There has been some suggestion that commercially available off-the-shelf Doppler radars would be capable of doing the job that needs to be done. I believe this committee may have in the past, in fact, reviewed that very question, and the answer comes down in my understanding to, no, it is going to take a Doppler radar specifically tailored for this job, and that program is within the FAA's budget now, and I find that this year they are in fact planning to modify 15 of the so-called Nexrad enroute radars so that they can get terminal applications sooner, and if memory serves me right, I believe Dallas/Ft. Worth is one of the 15 first airports to get that modified radar.

I frankly don't know that they could much accelerate that program. Merely placing a radar on an airport isn't going to do the pilots one wit of good if we can't get the essential low altitude windshear alert warning to the pilot in a timely manner.

Mr. LEWIS. Mr. Fleming, you know, you are going on and on, and I understand that. You know you have an ally as far as the trust fund. I am completely opposed to the use of the trust fund as it is now for FAA using it for operational and maintenance, and I would like to ask you three gentlemen to what extent you are willing to support the legislation that I and many other Congressmen are involved in in order to remove the trust fund from the budget lineup.

Mr. FLEMING. I can speak for ATA. We certainly would support such an effort. I am not sure that we are convinced that that action will effect the needed relief for FAA programs without some relief also from the Gramm-Rudman-Hollings legislation provisions, and that may be a more difficult proposition.

Mr. LEWIS. We might have to make our case. You know we don't have to let these cuts become automatic. We can be specific about them, and Congress has to step up to this. But to sit back and say, "Don't let Gramm-Rudman do this to us," I think we have to take some activity, and I want to know what the private sector is willing to do to come forward and say let's do something about this, and let's be more specific about the selection of the cuts and where they will be.

Mr. **Reilly**. Mr. Lewis, before you came in, in my statement I did mention AOCI's very strong support for taking the FAA items off budget. We very much support that concept.

Mr. **Lewis**. Your suggestion of a Federal corporation to manage the air traffic control system is interesting. How do you propose that this would work? Hopefully not like the Postal Service.

Mr. **Fleming**. I think the Postal Service, unfortunately, gets much maligned whenever the subject of Federal corporations is raised. We have not yet gotten to the point where we have prepared a specific plan for implementation. In fact, I mentioned that the National Academy study went further than the original ATA conception of the role of such a corporation, and that in fact we still have before our own Board of Directors the question of how far ATA as an association would advocate this corporate concept go.

We would have to consult with Members of Congress in great detail in terms of drafting, for example, model legislation as to what it would be that needs to be put into effect. If the Federal corporation were to operate the air traffic control system, they very clearly would have to take all the assets of the air traffic control system, the personnel, the related F&E funds, for example, to go with it.

The advantage we would see would be that it could be operated in a more business-like fashion; that it wouldn't be subject to the yearly whipsawing of the budget battle, and that it could undertake a more comprehensive set of plans to meet future safety and capacity needs, so that would be the overall objective.

Mr. **Lewis**. Thank you, gentlemen.

Mr. **Brown**. Gentlemen, I am going to defer any questions because we are trying to get through this hurriedly, but we would like to have the option of submitting some questions in writing to you, if we may, in order to complete the record.

Thank you very much for your very fine testimony.

Mr. **Reilly**. Thank you, Mr. Chairman, for the opportunity.

Mr. **Brown**. We will now call the remainder of the first two panels, Mr. Frederick Gammon, National Association of State Aviation Officials; Mr. John Sheehan, Aircraft Owners & Pilots Association; and Tulinda Deegan, Regional Airline Association.

We appreciate your being here this morning. We welcome your testimony. It will appear fully in the record at this point, and if you desire to summarize the statement in any way, you are free to do so. Do you want to begin, Mr. Gammon.

STATEMENTS OF FREDERICK GAMMON, FIRST VICE PRESIDENT, NATIONAL ASSOCIATION OF STATE AVIATION OFFICIALS; JOHN J. SHEEHAN, SENIOR VICE PRESIDENT, AIRCRAFT OWNERS & PILOTS ASSOCIATION; AND TULINDA DEEGAN, VICE PRESIDENT, REGIONAL AIRLINE ASSOCIATION

Mr. GAMMON. Thank you, Mr. Chairman and members of the subcommittee. I welcome the opportunity to appear before you today to provide comments on the fiscal year 1987 FAA research, engineering and development budget request. I am Frederick Gammon, first vice president of the National Association of State Aviation Officials and the appointed director of the Wisconsin Department of Transportation's Bureau of Aeronautics.

NASAO's primary purpose as an organization is to foster and encourage cooperation between the States, as well as the Federal and local governments in the development of an air transportation system that will be responsive to our Nation's needs. We are an active partner in this endeavor. NASAO is very concerned that delays for whatever reasons in the implementation of the national airspace system plan have begun to erode the promised advantages and benefits of the program.

One of the reasons for the delay, either directly or indirectly, has been caused by the vagrancies of the authorization and appropriation process. Many of us believe that this process, along with Gramm-Rudman-Hollings cuts have had, and will have, a devastating effect on the implementation of the many needed programs. It is this area in which the subcommittee can provide support to minimize these impacts. Prior to commenting on this in detail, we would like to comment on a few specifics of the FAA's budget request.

With respect to the national airspace system plan, in general terms, NASAO joins the entire aviation community in a recognition of the need for the modernization of the national airspace system. While still boasting the clear distinction as the most advanced and safest ATC system in the world, the aviation community is united in its demand to participate in creating an advanced system to accommodate the future needs of aviation. The NAS plan, regardless of its shortcomings, is an appropriate systems attack at an extremely complex and interrelated collection of programs. NASAO believes this approach to the modernization of the system is as valid today as when the first Brown Book was released.

As representatives of another responsible level of government, NASAO and its member agencies recognize the essential requirements for planning and implementing an advanced systems approach for the improvement of the Federal air transportation infrastructure. In fact, as partners in fulfilling many governmental mandates—and I want to emphasize the word "partners," in this—we believe State agencies can participate even more in delivering some of the products and services required by the system users. Our single major criticism of the FAA's plan is that it has not proven flexible enough to incorporate recent private sector and State government developments and opportunities. We do see a change, though, occurring in that regard.

A couple of examples of areas where the States have involvement and there is a chance for some cooperation. The first area is the Aviation Weather Dissemination Program. This is a good example of the NAS plan, to some degree, being incapable of incorporating new developments and methods of accomplishing the stated plan goals. These goals include aviation safety through better dissemination methods and savings of scarce dollars through advanced efficiencies of the delivery network.

This subcommittee is well aware of the current status of the FAA's Flight Service Station Automation project. NASAO shares the frustration of the entire aviation user community over the painfully slow introduction of current-generation technology into the FSS network. Since last summer, the entire model II phase of the program, which would literally place automation in the hands of the users, has been on a permanent hold.

Meanwhile, a couple of States, through their aviation agencies, have augmented the Federal system by providing a network of pilot self-help computer terminals at well-traveled airports. The State of Minnesota placed 53 terminals at 49 airports over 3 years ago. Since that time, these facilities have provided 24-hour access to aviation weather for pilots, as well as color weather radar displays to the general public through a Minneapolis-St. Paul public television station.

Wisconsin has also been on the leading edge of utilizing available technology. In 1984, the Wisconsin Department of Transportation developed a statewide system of 18 weather access terminals using private sector contracted services. The State's bureau of aeronautics is currently studying the options available to make the test program a more permanent service.

NASAO has informally discussed the opportunities available to the Federal system as a result of the State testing programs. Many other States are eager to become involved in a FAA/State Partnership Program. Some States may go forward with or without the FAA. Our suggestion to the FAA and this subcommittee is that our experience be made a part of the FAA implementation plan. More emphasis would be placed on the use also of off-the-shelf technology where available.

Another area that I would like to touch on is airport pavement management, this is an opportunity to pat the FAA on the back. This has been a small program, but we think it holds a lot of potential. It probably should be investigated for expansion. This program is producing a computerized pavement management program to be used by airports. It enhances the idea of preservation of existing pavement, and if implemented correctly will go a long way in saving construction money in the future.

We commend the FAA for their efforts in this program and appreciate that the users of the product—in this case, airport management, have had a chance to provide input.

Let me touch on the Aviation Trust Fund and unified budget for a moment. In 1982, NASAO joined with most members of the aviation community when we acknowledged the fiscal development requirements to take the U.S. aviation infrastructure into the next century. We agreed at that time to the concept of the direct users of the system paying the majority of the development costs for the modernized system. Now, unfortunately, NASAO must point to the history of the last 4 years which have proven our collective decision to trust the financing mechanism a wrong one.

The violation of the trust fund concept to provide the appearance of a smaller Federal deficit is an insult to the aviation community and those of us responsible for carrying out governmental mandates to assure an adequate air transportation system.

With the fiscal 1986 and 1987 budget requests, the facilities and equipment authorizations have been underfunded more than $1 billion since 1982. The trust fund contributors and the entire Nation, will have been denied over $½ billion in airport improvements. NASAO supports S. 1979, H.R. 4191, and any other effort to remove the Aviation Trust Fund from the unified budget process.

I have listed in the prepared statement other organizations that have policy statements on this issue. I won't go over those statements, but the organizations include the American Road and Transportation Builders, the American Association of State, Highway and Transportation Officials, and the American Transportation Advisory Committee. With that, I would like to conclude by saying we need the RE&D fund. We need it to preserve and continue the modernization of our system. Certainly our organization and, I think the aviation community supports that.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Gammon follows:]

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TESTIMONY OF THE
NATIONAL ASSOCIATION OF STATE AVIATION OFFICIALS

Before the

SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

Concerning

FISCAL YEAR 1987

FAA RESEARCH, ENGINEERING, AND DEVELOPMENT BUDGET REQUEST

April 22, 1986

Presented by
Frederick Gammon, Director
Bureau of Aeronautics
Wisconsin Department of Transportation
First Vice President
National Association of State Aviation Officials

The National Association of State Aviation Officials represents the service agencies in the various states as well as the Aviation Departments of Puerto Rico and Guam. Its members are the Aeronautics Commissions and Departments created under the laws of states to foster, develop, and regulate aviation at the local and state levels.

The primary purpose of NASAO as an association is to foster and encourage cooperation and mutual aid among the States, as well as Federal and Local governments, in developing both State and National air transportation systems that will be responsive to regional, state and national needs.

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Mr. Chairman and members of the Subcommittee:

I welcome the opportunity to appear before you today to provide comments on the Fiscal Year 1987 FAA Research, Engineering and Development budget request. I am Frederick Gammon, First Vice President of the National Association of State Aviation Officials and the appointed Director of the Wisconsin Department of Transportation's Bureau of Aeronautics.

NASAO'S primary purpose as an organization is to foster and encourage cooperation between the states, as well as the federal and local governments in the development of an air transportation system that will be responsive to our nation's needs. Our individual members are charged with the responsibility of fostering, developing, and regulating aviation at the local and state level. In such a capacity, the states are deeply interested in the federal research and development efforts to accomplish our common goals.

NASAO is very concerned that delays - for whatever reasons - in the implementation of the National Airspace System Plan have begun to erode the promised advantages and benefits of the program. One of the reasons for the delay, either directly or indirectly, has been caused by the vagrancies of the authorization and appropriation process. Many of us believe that this process, along with Gramm-Rudman-Hollings cuts have had, and will have, a devastating effect on the the implementation of the many needed programs. It is this area in which the Subcommittee can provide support to minimize these impacts. Prior to commenting on this in detail, we would like to comment on a few specifics of the FAA's budget request.

National Airspace System Plan

In general terms, NASAO joins the entire aviation community in a recognition of the need for the modernization of the National Airspace System. While still boasting the clear distinction as the most advanced and safest A[illegible]em in the world, the aviation community is united in its demand to participate in creating an advanced system to accommodate the future needs of the nation. The NAS Plan, regardless of its shortcomings, is an appropriate "systems" attack at an extremely complex and interrelated collection of programs. NASAO believes this approach to the modernization of the system is as valid today as when the first "Brown Book" was released.

As representatives of another responsible level of government, NASAO and its member agencies recognize the essential requirements for planning and implementing an advanced systems approach for the improvement of the federal air transportation infrastructure. In fact, as partners in fulfilling many governmental mandates, we believe state agencies can participate even more in delivering some of the products and services required by the system users. Our single major criticism of the FAA's Plan is that it has not proven flexible enough to incorporate recent private sector and state government developments and opportunities.

The states certainly agree that the ATC system must remain a federal system. While we have not investigated the development/testing and implementation of all of the NAS Plan improvements in great detail, we do have a few specific areas we would like to bring to the Subcommittee's attention. These areas include where the states have their own experience in design, testing and evaluation of advanced

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services to pilots and an involvement in improved techniques to preserve existing airport facilities.

Aviation Weather Dissemination

This is the classic example of the NAS Plan being incapable of incorporating new developments and methods of accomplishing the stated Plan goals. These goals include aviation safety through better dissemination methods and savings of scarce dollars through advanced efficiency of the delivery network.

This Subcommittee is well aware of the current status of the FAA's Flight Service Station automation project. NASAO shares the frustration of the entire aviation user community over the painfully slow introduction of current-generation technology into the FSS network. Since last summer, the entire Model II phase of the program - which would literally place automation in the hands of the users - has been on permanent hold.

Meanwhile, a number of states, through their aviation agencies, have augmented the federal FSS system by providing a network of pilot self-help computer terminals at well-travelled airports. The State of Minnesota placed 53 terminals at 49 airports over three years ago. Since that time, these facilities have provided 24-hour access to aviation weather for pilots, as well as color weather radar displays to the general public through a Minneapolis-St. Paul public television station.

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Wisconsin has also been on the leading edge of exploiting the available technology. In 1984, the Wisconsin Department of Transportation developed a statewide system of 18 weather access terminals using private sector contracted services. The State's Bureau of Aeronautics is currently studying the options available to make the test program a permanent service by reducing the communications costs.

NASAO has informally discussed the opportunities available to the federal system as a result of the state testing programs. Many other states are eager to become involved in a FAA/state partnership program. Some states will go forward without the FAA. Our suggestion to the FAA - and this Subcommittee - is that our experience be made a part of the FAA implementation plan. More emphasis should be placed on the use of "off-the-shelf" technology.

Airport Pavement Management

The highest single priority within the stewardship of the nation's airports is and should be the preservation of those facilities in a safe condition. The accomplishment of this goal provides a positive example of the cooperation that is possible between the federal and state governments. Under contract to the FAA, 40 states participate in the airport safety data program. This program includes site inspections to assess the condition of the airport. Of course, this program is well suited for the states since most states would otherwise be visiting the airports to accomplish similar state responsibilities for airport and aviation system oversight.

The states have played an active role in the advancement of the science of facility pavement management and evaluation. As the collective largest owner of airports in the nation (33 states own and/or operate airports), and the agencies responsible for state aviation system plans, NASAO members are vitally interested in preserving the existing airport network. In conjunction with and building on the experience of the Army Corps of Engineers and the states' Departments of Transportation, a system has been developed to exploit automated techniques to more effectively manage and preserve airport pavement. The states are involved in the design and testing of these methods for airports of all sizes. We commend the FAA for their efforts in the program, and appreciate that the users of the product - in this case, airport management - has been involved in the design and test phase. We encourage the Subcommittee to reenforce the need for this program within the FAA research budget request. Small amounts invested in R&D now are providing opportunities to save considerable funds in airport reconstruction later.

Aviation Trust Fund / Unified Budget Process

In 1982, NASAO joined with most members of the aviation community, when we acknowledged the fiscal development requirements to take the United States aviation infrastructure into the next century. We agreed at that time to the concept of the direct users of the system paying the majority of the development costs for the modernized system. Now, unfortunately, NASAO must point to the history of the last four years which have proven our collective decision to "trust" the financing mechanism a wrong one. The violation of the "trust" fund concept to provide the appearance of a smaller federal deficit is an insult to the aviation community and those of us responsible for carrying out governmental mandates to assure an adequate air transportation system.

With the Fiscal 1986 and 1987 budget requests, the facilities and equipment authorizations have been underfunded more than $1 billion since 1982. The trust fund contributors - and the entire nation - will have been denied over one-half billion dollars in airport improvements. NASAO supports S.1979, H.R.4191, and any other effort to remove the Aviation Trust Fund from the Unified Budget Process.

The aviation community is not alone in its recognition of the effects of these shortfalls in transportation funding. The inter-relationship of aviation to other transportation modes and the inter-dependence of all modes being developed for the future is evident in the policy positions of many transportation related organizations:

* The American Road and Transportation Builders Association states: "The Trust Fund is a dedicated funding source collected from aviation users to pay for airport and airway improvements. ARTBA supports the continued dedication of the Trust Fund-including interest accrued on the fund."

* The American Association of State Highway and Transportation Officials: "The federal government should retain the responsibility of collecting Airport and Airway Trust Fund revenues. Taxes collected from system users and placed in dedicated trust funds should be promptly and fully used to accomplish the purposes for which they were collected.

Interest which accrues to Trust Fund monies is an integral part of that Trust Fund, and should, along with the Trust Fund monies, be dedicated only to those uses which help accomplish the goals for which the Fund exists. Airport and Airway Trust Fund surpluses should be drawn down by appropriating the funds for the purpose for which they were collected: improvement of the airport and airway system.

Congress should remove trust-funded programs from the Unified Federal Budget.

The Airport and Airway Trust Fund should not be subjected to the expenditure ceilings used in the Unified Budget process to help reduce the national deficit.

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* The recent third report of the American Transportation Advisory Council, a coalition of associations and private-sector organizations concerned with the future of transportation in the U.S., stated that trust funds "are sound financial mechanisms for the improvement of the nation's transportation system. They have enabied important and sorely needed transportation improvement programs to move forward without impacting general revenues.

Under the present budgetary process, trust funds are subject to the annual budget resolution approved by the Congress. As such, they also are subject to an expenditure ceiling, device used to limit the overall budget levels. Consequently, the capital program improvements envisioned, and used as the basis for enacting the user fees in the first place, suffer from subtantially reduced financing. Programs financed through dedicated funds, the user fee revenue system, do not add to the overall deficit since they are not part of the general revenue.

Congress should examine the user fee mechanism and remove these dedicated funds form the unified budget process. Those who pay these "user fees" should be guaranteed that they are disbursed and used for the programs for which they are intended, without any restriction or fiscal limitations.

The American Transportation Advisory Council does not believe the current tax should be reduced or interest from the Airport Trust Fund diverted into the General Fund. The integrity and the original intent of the Airport and Airway Trust Fund must be maintained. User fees collected for airport safety and capacity development should be used only for those purposes. Limited funding of operational and maintenance expenses from the Trust Fund should be made only after the primary airport system needs are met."

Conclusion

NASAO appreciates the opportunity to participate in this hearing which is so vital to the future of our air transportation system. I would be happy to answer any questions the Subcommittee might have.

# # #

Mr. **Brown**. Thank you, Mr. Gammon. Mr. Sheehan.

Mr. **Sheehan**. Good morning, Mr. Chairman, and thank you. My apologies for being late. There was a little schedule mess-up there. I would like to submit my written testimony for the record.

Mr. **Brown**. You don't have to apologize. It is working out very well. It shows how flexible we can be.

Mr. **Sheehan**. I love it.

Mr. **Brown**. Your statement will appear in full, and you may summarize if you wish.

Mr. **Sheehan**. The FAA's R&D budget and the total R&D effort over the last 5 years I have had an opportunity to look at has been beset by delays and false starts and unfortunately some piecemeal efforts. A lot of these faults have caused the advantage of technology to be lost. Much of the NAS plan that we are attempting to implement now is late seventies technology. We are not taking advantage of what has come down the line in the intervening years.

I don't know what came first, the decrease in funds for RE&D in the FAA budget, or a seeming drift in what the FAA wanted to do with regard to their total R&D effort. By that I mean there seems to be a lack of central focus in their R&D efforts. There is on overview of the system within the FAA that would tend to give it a thrust that would support, supposedly, what they are trying to do.

Well, I don't know if that came first or the decrease in funding over time. The severe reduction in funding has severely strapped the FAA's R&D Program. It is inadequate, and the irony of the whole thing is that the trust fund moneys are there for that purpose. And since everybody else has taken a shot at the trust fund, I might as well summarize our position on the trust fund and say that, yes, we do support taking it off budget. We do support stopping a raid on the trust fund for taking as much as 75 percent of the FAA's O&M moneys out of the Aviation Trust Fund.

We do support the maintenance of the penalty triggers in the trust fund for the Airport/Airway Improvement Act and the maintenance of interest payments, all of these things the administration is trying to do away with. Most of all, the trust fund should be spent. There was a definite purpose it was designed for, and it wasn't designed to sit there and gain interest, although we would love to see that $790 million interest for fiscal year 1987 maintained in there.

Just a few comments on some of the individual programs—the advanced automation system is a $3 billion program that seems to be slowing down, and it is slowing down precipitously. I'm sure you are all aware of the GAO's, I thought, rather stinging report, of lack of progress in the advanced automation system, but more than that, the central thrust is that the advanced automation system has not had its concepts validated. It has no real substance throughout any sort of R&D program. It is not following the rules, and because of that, I think they are going to wind up in serious trouble.

I guess the biggest thing that disturbs us is the fact that the cost benefit originally given to the advanced automation system has seemed to be eroded. I know that we are still studying that, but we have it on good authority that the cost benefit for advanced automation is just about gone, and I think that we should accelerate our investigation of those cost benefits to make sure that we can shut off what we need to shut off before its too late.

We do support continuation of one segment of that program, and that's the Controller Sector Suite Program, which would have an application in any system and would give us improvements with the interim system that we are living under now, the Host system.

I would like to echo some of the things that Mr. Gammon said about the flight service station system. I think it is a travesty that we have been hacking away at an automated flight service station system for in excess of 6 years now, and we have just barely gotten the barest rudiments of the system, the so-called model I advancement commissioned about a month ago, and even in that commissioning, the flight service station specialists have to work around some 49 major discrepancies. They have a book on how to work around the discrepancies.

In my way of thinking that is not true commissioning. Mr. Gammon also said, the model II, the ultimate automation of that system, has been stopped just because they had to wait to see if model I was going to work. Although model I has been commissioned, we are not really sure that that is going to give us equal or better service that was guaranteed under the advanced automation system.

One little example that really bothers me with regard to the advanced automation system is that one piece of that system is something called direct user access, and direct user access terminals. This enables an individual pilot to get his own weather briefing, both graphics and alpha numerics through his own home computer by dialing up a toll-free line.

FAA spent an excessive $16 million on this. We have only gotten one small part of it, and that's a computer synthesized voice response system for only 30 percent of the pilots on the country. The biggest piece of this thing, the duat terminal, the thing that will serve a personal computer, we have spent over $10 million on. We still don't have it, and the FAA can't make up their mind what to do about either using their own system or choosing from one of six very capable private systems in the so-called AVCOMPS groups. We think that the FAA should be spurred to accelerate their decisionmaking capabilities with duat, and let's get on with it.

Airport capacity, I would like to echo Mr. Reilly's sentiments, is an extremely important program, and something that has been underfunded for at least 3 years that I have been working with it. We can gain tremendous capacity increases if we can get that research going, and to address one of Mr. Packard's concerns that he voiced earlier, this in no way will reduce safety.

The reason that we don't have some of these very important improvements is that we have been going to great, great lengths to make sure that we are not going to have an unsafe procedure or system, so I am convinced we are going to have a very safe system.

I would like to comment slightly, just a little bit on an Nexrad and terminal Doppler weather radar. We have been waiting for Nexrad for a long time. It looks like it is progressing nicely. One thing I have said before this committee for 2 years running and before the Appropriations Committees for 3 years is the fact that we needed to get on with a terminal Doppler weather radar system, and we couldn't wait until Nexrad was fully developed until we got the terminal system. I am very pleased to see, and I know that comes as a surprise to a lot of people, I am pleased to see something that FAA's done. I'm pleased to see that the FAA has said, let's pull 15 Nexrad's off the line and make them terminal Doppler weather radars.

I think it is a great thing they have done. I am little bit suspicious as to how much each one of those is going to cost, but just short of saying terminal Doppler weather radar at any cost, I'm glad to see that they are doing it. I would encourage them to use this philosophy of stopping something that they have been tracking for such a long time, and rethinking that procedure and coming up with something that is better.

Finally, the systems engineering integration contract that is supposed to make the R&D and the NAS plan all come together in effect for several years now. It is a $685 million contract. There is another $85 million due in the fiscal year 1987 budget, and I ask the question, are we getting our money's worth in view of the constant criticism that has been coming from many sources in the industry, but most especially the recent criticism from the GAO.

The systems integration contractor is the company that is supposed to be making all this fit together and make it all work. I don't think we are getting our money's worth, and I think that contract should be examined closely.

Thank you. I'd be glad to answer questions.

[The prepared statement of Mr. Sheehan follows:]

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STATEMENT OF JOHN J. SHEEHAN, SENIOR VICE PRESIDENT

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

Regarding the Status of the National Airspace System Plan

COMMITTEE ON SCIENCE AND TECHNOLOGY

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

HONORABLE GEORGE E. BROWN, JR., CHAIRMAN

UNITED STATES HOUSE OF REPRESENTATIVES

TUESDAY, APRIL 22, 1986

Mr. Chairman, the Aircraft Owners and Pilots Association appreciates this opportunity to testify before this subcommittee and to present our views regarding the status of the National Airspace System Plan (NASP) and the resources committed to support it.

AOPA continues to have reservations about the efficacy of the FAA's planning for the improvement of the national airspace system and its ability to conduct research and development. We have voiced these concerns, identified shortcomings in the plan and objected to FAA's dogmatic pursuit of benefits which never seem to materialize.

Clearly, technological delays and recent budget initiatives have intervened in the NASP timetable. Technology has advanced so rapidly that elements of the plan are often obsolete before the FAA can complete its R&D effort. All too often, private sector developments in identical technologies so outstrip FAA R&D accomplishments that the FAA is compelled to "trash" programs despite very heavy sunk costs.

We suggest today that some reasonable balance must be achieved between funding for FAA technology development and private sector acquisition in light of valid cost/benefit analysis. It also seems appropriate to invite this subcommittee to reassess the propriety of the FAA mission to conduct research and development. Perhaps these functions would more appropriately be accomplished by NASA.

NATIONAL AIRSPACE SYSTEM PLAN (NASP)

We believe that the NASP contains programs whose completion is requisite to the continued viability and safety of the air transportation system. We are just as firmly convinced that many of the NASP programs were conceived without consideration of what the users' needs were, and in many cases the programs have been overtaken by rapidly advancing technology.

The Advanced Automation System (AAS) is an example of the latter.

Advanced Automation System

We agree with the General Accounting Office (GAO) assessment of the AAS program expressed in the June 17, 1985 interim report (IMTEC-85-11). Certainly rushing into the production of such a complex acquisition as this $3.2 billion software, hardware, and workstation upgrade deserves additional Congressional attention.

The FAA's 1987 Fiscal Year budget proposal requests $61.8 million to amend the $246.8 million design competition contracts awarded in 1984. These amendments are to refine "system level specifications and a more exact set of performance requirements."

Even the FAA's optimistic forecast of availability suggests that AAS will not really be fully operational until the turn of the century. We have to believe that satellite solutions to communication, navigation and surveillance problems of today's ATC system will be possible by that time. AAS should not proceed until such technological advances are exploited.

As the GAO report noted, plans to award the acquisition contract before completing hardware and software development and testing, and without validating functions will lead to significant increases in cost and, perhaps more damaging, extensive delays which will make the AAS obsolete before it is operational.

We are not comfortable that the cost/benefit study with which the FAA justifies the AAS will prove to be valid. The impact of Gramm-Rudman-Hollings, the FAA's phased implementation of AAS, benefits taken "up-front," and various weaknesses in the cost/benefit analysis lead to the conclusion that all benefits will not materialize.

AOPA recommends that the AAS implementation be delayed in favor of further development of the host computer. FAA should proceed with the initial sector suite, but should review AAS to ensure that it will be able to take advantage of satellite technology to meet user airspace system needs.

Microwave Landing System (MLS)

First introduced in the early 1970's, the MLS program is now caught between FAA commitment to continue implementation and user doubts concerning system advantages and the realities of budget constraint. In large part, Instrument Landing System (ILS) technology has rendered many previously touted benefits of MLS moot.

Communities have been denied precision approach capability far longer than necessary due to the decision to suspend ILS installations in favor of MLS. Before any increase in the number of approaches available occurs, the FAA will have to replace 750 high-technology, solid-state ILS ground systems with an MLS which is essentially a clone in terms of initial capability.

FAA cost estimates for MLS are still far from reality. The 1987 budget request asks for funds to procure MLS avionics at $78,000 per aircraft, and MLS ground stations at more than $760,000. The first number is quite high (by at least 200%) and the second number is still low, but approaching reality. Price as a benefit for MLS has disappeared.

It is interesting to note that while the FAA denies additional ILS implementation and development, the search for improvements in precision approach equipment continues with NASA funding. Successes such as the Portable Tactical Approach Guidance (PTAG) System demonstrate the private sector ability to advance technology. Although designed for military use, this $50-100,000 ground set may eliminate at least one of the reasons for the MLS transition, and at fractional cost.

AOPA recommends that by 1998 the FAA install MLS at airports to meet international agreement and where ILS already exists, to realize what capacity enhancements are available. We also recommend continuing a moderate ILS implementation, installing approximately 300 ILS at airports which can qualify for precision approaches. Clearly, a new ILS initiative will demand a new, creative policy with regard to ILS procurement. We believe alternatives to federal ownership of navaid equipment, such as lease or lease/purchase, exist.

It is important to recognize that FAA has not yet completed development in the MLS program which will permit use of MLS for category II or III approaches required by air carriers, nor provided the system capacity increases alleged to accompany the MLS implementation.

Despite these drawbacks, airborne avionics costs will fall to a level attractive to the broader segment of users only if air carriers who can afford the initial artificially high prices "prime the pump." Installation at air carrier airports already served by ILS will stimulate avionics production while providing early benefit to the air carriers. Continuing the ILS implementation will immediately expand precision approach capability. (See attachment.)

Mode S

Mode S may eventually provide a limited data link capability for communication from the ground to aircraft in flight. It will not provide service to aircraft operating at altitudes below 6000 feet or on the ground at most locations. Most significantly, Mode S will never be compatible with satellite communications, the promise of the next decade. Mode S will not provide meaningful communications service until after the mid-1990's, yet the U.S. airlines will own and operate a satellite communications system as early as late 1987.

It is inconceivable that the FAA, enthusiastic in its pursuit of Mode S technology, still has not been able to describe the sort of messages its data link will carry. And, the data link will not be able to carry significant amounts of information to make the system realize its full potential.

AOPA enthusiastically supports FAA's implementation of the mono-pulse Mode S ground radar equipment because nearly all of the benefit to be derived from Mode S (radar accuracy, reduced clutter and reduced controller workload) result from that technology, not from airborne Mode S transponders. The current ATCRBS transponder is compatible with all elements of the Mode S implementation and should be protected.

Traffic Alert and Collision Avoidance System (TCAS)

The FAA has spent more than $41.5 million in an effort to create a viable TCAS device. We understand that a TCAS II device has within the last two weeks passed initial flight tests on board a Piedmont aircraft. Still, the FAA is a long way from production model TCAS, despite the large investment.

Most TCAS advocates agree that horizontal and vertical resolution advisories are necessary to any successful application, but there is no agreement regarding the impact of TCAS-prompted maneuvers on the so-called ATC/pilot contract or the potential for conflicts generated by these maneuvers.

This committee might ask, what will the $45 million invested in TCAS have bought us by the end of 1987?

Flight Service Stations

Direct user access (DUAT): The FAA has spent more than $16 million to create its own DUAT capability. It undertook this task at a time when several commercial weather information vendors offered similar services.

After five years, the FAA has terminated attempts to duplicate private sector technology, but the 1987 budget request contains $1.5 million to continue DUAT activity. What are they trying to accomplish?

Automated Flight Service Station: (Model I) Congress mandated that FAA ensure that automated flight service stations be fully capable of providing service equal to or better than that provided by older FSS in service, before the older stations were to be closed.

Although FAA now says it has "commissioned" Model I, we maintain that the system is still merely a prototype. FSS specialists have devised 49 operational procedures to work around problems not resolved in software prior to the Model I being forced on line.

Problems continue, and equal or better service has yet to be delivered. We believe this completely disregards Congressional direction.

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The prime contractor for the AFSS, E-Systems, has failed to provide an adequate system under their contract, and the FAA has not seen fit to enforce the provisions of the contract. We feel that this committee should investigate this issue.

Human Factors Research

If "faint praise" kills, underfunding is clearly the "death knell" for FAA R&D on aviation human factors. While the House Aviation Subcommittee Chairman Norman Mineta calls for increased human factors research, the FAA has requested a paltry $65,000 for 1987. Between NASA and FAA, less than a million dollars has been requested for this effort in 1987.

Obviously, we are disappointed in this unacceptably shallow commitment to such critical research. This committee should direct the FAA to expand their human factors activity or to give the $65,000 to NASA.

Automatic Weather Observing Systems (AWOS)

The FAA proposes to spend about $20 million for AWOS in 1987. AWOS is another "miracle" of the FAA R&D effort which has not met expectations.

The GAO reported that "FAA tests and demonstrations have shown that AWOS cannot meet the FAA's operational requirements." "Therefore," the GAO concluded, "the FAA intends to augment the AWOS with weather observers at commercial airports."

Although enthusiastically supporting development of an adequate AWOS device to meet general aviation needs at numerous airports where observers are not economically justified, AOPA is not impressed by the FAA's success with AWOS.

AWOS needs further development--but for how long and at what expense?

NEXRAD

Although the Airport and Airway Improvement Act of 1982 authorizes use of the Aviation Trust Fund for financing NEXRAD development and procurement, we do not believe that there was intent to ignore the public benefit derived from NOAA weather services resulting from NEXRAD.

The NEXRAD joint program agreement between NOAA, DoD and the FAA recognized this public benefit by allocating approximately 60 percent of development and 50 percent of procurement costs for NEXRAD to NOAA.

We do not believe that an adequate cost/benefit study has been conducted or that cost/benefit analysis will support the decision to provide more than 80 percent of NEXRAD funding in 1987 from the Trust Fund. More than $196 million will be obtained from the Trust Fund for NEXRAD over the next three years, not including FAA's contribution to the procurement program.

While we support NEXRAD, the aviation community should only pay its fair share, and an appropriate contribution for public benefit should be made by the general fund.

FAA FY 1987 BUDGET PROPOSAL

Operations and Maintenance

The President's FY 87 budget provides $2.8 billion to operate and maintain the national airspace system, provide safety and security inspections, establish and enforce air regulations and administer airport grants.

His budget will permit an increase of 500 air traffic controllers and 138 general aviation and air carrier inspectors funded from Trust Fund receipts. At the same time, the budget calls for a decrease in the number of flight service station specialists by some 750 positions nationwide, nearly a twenty percent reduction.

The FAA's FSS automation and consolidation plans have been plagued with technical difficulties, and personnel shortages have been created by poor staffing procedures within the FAA. Any reduction in the flight service station staffing levels will adversely affect levels of safety in the NAS. These positions must not be eliminated until automation and consolidation are back on track.

The budget also will reduce the number of personnel available for the maintenance of airway facilities and navaids. Remote maintenance monitoring is nice to have, but navaid equipment failures will still demand responsive repair. It will not be acceptable to dispatch technicians from some control location since outages will impose unacceptable delays and create new safety concerns.

AOPA opposes such decreases in personnel in these vital aviation functions.

Facilities and Equipment

The NASP essentially froze technology at the 1981 level (if all NASP programs at that time consisted of 1981 technology). The FAA's fully funded budget concept and resistance to any change in the NASP perpetuate continued expenditures for R&D and F&E to support programs made obsolete by advancing technologies.

The President's budget calls for a thirteen percent cut from the 1986 appropriations level for F&E procurements and installations, providing $825 million to continue the NASP. This reduction in funding will force delays in key NASP programs and has led to the FAA's proposal to take programs off "full funding" status.

These factors will provide the opportunity for Congress, system users and the FAA to carefully review progress and utility of some of these efforts and to redirect funds to achieve user-desired objectives.

AVIATION TRUST FUND

Billions of dollars paid by users of the airspace system are not being utilized. The uncommitted balance in the Aviaion Trust Fund, now more than $2.5 billion, is growing faster than ever in its fifteen-year history. This surplus represents user tax revenues held hostage in the war on deficit reduction.

The large Trust Fund surplus is an irresistible target, and the Administration has proposed legislation to fund 75 percent of the FAA's operating costs, an additional $736 million beyond what is authorized by law, even without penalties, from the Trust Fund. We believe this to be a direct contradiction of the purpose for which Congress established the Trust Fund.

The Aviation Trust Fund is based on the equity of user benefits stemming from user-paid premiums. The Fund should not be subject to deficit reduction without recognition of that equity.

We strongly oppose this "raid" on system users' equity in future NAS development and safety.

AOPA agrees that a legislative solution must be reached in order to free the Aviation Trust Fund from the constraints of the Federal Unified Budget where user taxes are used to shelter other spending from the General Fund.

For these reasons AOPA supports HR 1491 and S 1979 to take the Aviation Trust Fund "off-budget" but continue it as a part of the annual federal appropriations process. We encourage your efforts to ensure that the Trust Fund is actually used for the purpose it was intended--enhancement of the utility and safety of this country's airport and airway system.

We urge you to press for adequate funding of Trust Fund programs. This support requires no cut in any other federal program since Aviation Trust Fund receipts, estimated to exceed $3.3 billion in 1987, are more than sufficient to cover authorized appropriations.

There is no need to increase tax levels.

Penalty Provision

AOPA opposes the Administration's effort to remove the penalty provision contained in the Airport and Airway Improvement Act. The provision ties the O&M funding level from the Trust Fund to the expenditures for aviation capital improvements in the F&E account. It was instituted to ensure that the Aviation Trust Fund would not be diverted for support of FAA operating expenses and to force full funding.

We believe this to be a valuable provision which provides impetus to ensure that taxes raised to improve the ATC system are actually spent for capacity and safety improvements and not siphoned off for annual operating expenses and salaries.

Additionally, the interest payments provided for the Trust Fund balance must be maintained. Any attempt to remove this valuable provision (estimated to be $790 million in FY 87) may be likened to misappropriation of funds.

FAA RESEARCH AND DEVELOPMENT

Experience with FAA efforts at R&D since the inception of the NASP lead to the conclusion that FAA R&D may be a contradiction of terms. Example after example can be put forward to demonstrate that the FAA R&D program moves so slowly as to be glacial, while technology in the private sector leapfrogs into the next century.

The FAA's snail's pace delivery of usable products hampers the national airspace system. Often products delivered are of little benefit because they have been rendered obsolete by advancing technology; the development process has produced devices not directly applicable to the need expressed by users; or developments outside the FAA R&D process render the FAA's efforts of little value.

There seems to be little central direction to the entire effort. Programs do not have proper continuity, nor are critical needs emphasized. More emphasis must be given to these effots.

CONCLUSION

If the FAA is to continue its R&D activities, it is imperative that sufficient funding be made available. Decreases in R&D funding seem to ignore many of the most critical issues facing aviation in the coming years.

Programs such as FSS automation, human factors workload, satellite applicability study, and saftey-related efforts need additional funding if they are going to come to timely completion. Delay in research programs will stifle the progress of aviation and air commerce.

Airport capacity increases offer the potential for the greatest return for each dollar invested. Clearly, a significant contribution must be made to adequately fund R&D of the very important airport capacity issues.

Finally, a disproportionate amount of the R&D budget is committed to the AAS program. Funds should be reallocated from this concept which is constrained to ground-based communications, navigation and surveillance systems, in favor of investigation of high-technology, efficient, satellite solutions. The host computer will provide adequate system capacity until satellites can be fully evaluated.

Thank you, Mr. Chairman, for the opportunity to present these comments.

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AOPA
AIRCRAFT OWNERS & PILOTS ASSOCIATION
421 Aviation Way, Frederick Municipal Airport, Frederick, MD 21701 Telephone (301) 695-2000 Telex [illegible]

January 27, 1986

Mr. Donald D. Engen, Administrator
AOA-1
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Dear Don,

I am sure that you are aware of concerns expressed by the entire aviation community regarding the almost assured adverse impact of Gramm-Rudman-Hollings on the modernization, airports and regulatory efforts of the Agency. This being the case, I believe that a positive step to preserve what will be shrinking resources (and one which would resolve a longstanding area of disagreement between us) would be a major re-thinking of the Agency's position regarding MLS.

For some period of time I have felt like the "voice in the wilderness" on this issue, having opposed the method of implementation from the day of Lynn's draconian announcement; I now feel like the leader of the band. As time has dragged on and the industry has suffered from the lack of a positive program for the timely installation of precision approach equipment, more and more support has developed for our position. Indeed, currently we are aware of no significant informed support from any quarter of the user community for a broad-based implementation of the MLS. The Agency has lost the support of the air carrier industry and the commuters, and it is left with only the manufacturers of the equipment, the politicians who represent their districts and those few who superficially perceive that new has to be better!

I am sensitive to the ICAO requirements for MLS implementation at the international air carrier airports in 1998. Also, we recognize that there are a very few airports where the criteria for precision approach installations have been met and an ILS simply will not play. But neither of these problems justifies the current situation: interminable delays in the availability of precision approach installations; the prospect of staggering cost to the users to install and carry a second set of airborne equipment, and the major cost to the Agency to procure and operate an MLS system that will probably be overtaken by new technology before the system is fully implemented have offset any hope for significant benefit. To quote Dick Tabery, Senior Vice President United Airlines, "It is not the MLS we once fought for--only a replacement for the current ILS which works just fine. MLS may be an idea whose time has come and gone!"

Because the Agency has already contracted for a number of the systems, our recommendation is that these be installed at international airports, heliports and the few other facilities that qualify for a precision approach but where ILS is not an option. The second step would be the procurement of additional ILS systems that incorporate the current state of the art, such as remote monitoring, the new antennas and modularized construction.

This more limited procurement effort would clearly benefit the user community since FAA would not have to replace all the existing ILS systems. We would see the resumption of the timely installation of needed precision approach systems, would save the users literally billions in airborne equipment costs and would husband what will be increasingly dear facilities and equipment dollars for really important and necessary equipment.

I urge you to give serious consideration to this proposal during the upcoming period of trials and tribulations in the budget battle. Please be assured of our support in your efforts to keep the various programs afloat.

Sincerely,

John

John L. Baker
President

Mr. Brown. Thank you, Mr. Sheehan. Ms. Deegan.

Ms. Deegan. Yes, Mr. Chairman, I would like to also depart from my prepared text, since all the points really have been made by the previous witness, I will just go down the list of your six questions that you asked us to answer.

Your first question is, "In your view, are the NAS plans in general, AAS in particular, still current and necessary since their inception?"

We at the Regional Airline Association feel that the initial intent of the NAS plan was to recognize the RE&D risks in the dynamic environment of changing requirements and technology. While the original concepts and priorities back in 1981 for the NAS plan may have changed, the need for monitorization of the air transportation system is even greater now than it was 1981. Although our future benefits may not be wholly clear at this point in time, we can be sure that the cost by not progressing with the plan now will be extremely high.

Even if inflation is low, as it is right now, the cost will continue to escalate to put a plan into effect down the road. The reason for this is that if we have the current budget levels, the current system will continue to deteriorate instead of getting off at the plane we are now and continuing to increase the capacity and technology, we will have to be playing catch up.

The FAA Advanced Automation System remains the keystone of modernization in developing air traffic control safety and efficiency. There are alternatives to the FAA's chosen path for the system. However, the timely implementation of a program is critical at this point in time. Every day of delay adds risks and costs of growing demand, increasing delays, aging equipment and changing work force demographics.

Your second question is, "In your estimate will the fiscal year 1986-87 administration budget support the NAS plan?"

Mr. Chairman, we are at a cross-roads right now with the NAS plan. The current fiscal proposals by the administration will mean that there will be sizable reductions in the cohesive organized plan that has been put forth by the national aerospace system plan. Sizable reductions either in the budget as proposed by the administration or the sequestering process under the Gramm-Rudman-Hollings Act, will cause the plan to fall apart at the seams, and instead of having one unified package go through, we are going to end up with a piecemeal approach.

Your third question is, "Do we concur with the GAO report?" Basically, we feel that, as I said earlier, that FAA's plan for AAS is one plan. The GAO has certainly criticized it. An independent study of the cost and benefit was funded by Congress and is due to be completed within the next 10 months, so clearly there is discussion on the subject. We feel that at this time we have to continue funding the AAS plan to make sure that everything is kept on track.

Yes, we can continue to study it, as was pointed by Mr. Sheehan, but let's not take it off the track while we are studying it. Let's keep the money flowing to the program.

Fourth, "What is your view on the disposition of the continuation of the trust fund, and do you support the continuation of aviation taxes at approximately the present levels?"

Our current budget crisis we are dealing with right now is a culmination of 10 years of broken promises by the administrations and Congresses to fully support aviation requirements through user generated taxes. It is apparent that the provisions of law contained within the current trust fund legislation has not prevented continuing attacks upon the yearly aviation appropriations.

We must take whatever action is necessary as an industry to insure that moneys generated through the user taxes go to the trust fund are fully spent in a timely manner to sustain and advance the national air transportation system. RAA definitely supports taking trust fund off the budget. We are also are carefully examining the proposals that ATA has generated through the NAPA study in making the air traffic control system a Federal corporation. We feel that something has to be done, and those two are two very good alternatives for us as an industry to be looking at.

Finally, "Do you have any specific concerns about FAA's proposed approach to designing and developing and testing NAS?"

Although the national airspace system plan outlines a systematic approach to the development of the national airspace system, additional flexibility is needed within this plan to cope with changing requirements and technological opportunities. These issues focus upon both FAA policy and fiscal management.

FAA must better exploit commercially available products and services when and where benefits will be rapidly realized. This opportunity exists in areas of rapidly changing technology and application of technology where private enterprise is not constrained by the traditional federal process of procurement that often results in outdated products being delivered. Alternatives such as equipment leasing should also be considered to support these types of commercial products as well as considerations for satisfying interim system and transition system needs as NAS modernization proceeds.

In conjunction with the increased flexibility for system development, limited discretionary funding should be made available for RE&D work which can be accomplished in less than three year son an FAA departmental basis. This type of funding availability with proper oversight would encourage innovation to rapidly solve time critical problems which often develop in a dynamic service environment.

Lastly, we would encourage the FAA to undertake more joint development and evaluation with the users of many of the NAS Plan initiatives to resolve perceived or actual problems and insure that those plans do in fact contain the safety, capacity and cost benefits stated or implied. Programs such as TCAS, AWOS, MLS, etc. could benefit greatly from increased field participation by the aviation user community.

Mr. Chairman, this concludes my remarks, but the bottom line is, yes, we have to keep the money flowing to RE&D.

[The prepared statement of Ms. Deegan follows:]

Regional Airline Association
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Telephone 202 857-1170
ARINC "WASRAXD"

Statement of

Tulinda Deegan
Vice President
Regional Airline Association

Before the

Committee on Science and Technology
Subcommittee on Transportation, Aviation and Materials

on

Tuesday, April 22, 1986

Formerly the
Commuter Airline
Association of
America

My name is Tulinda Deegan, Vice President, Regional Airline Association. Accompanying me today is Mr. Gary Church, Technical Consultant to RAA.

Thank you for the opportunity to be here today to express the views of the members of the Regional Airline Association which serve over 850 small communities and major cities in the United States today.

Mr. Chairman, we have unfortunately reached a major crossroads in determining the future of the national airspace system plan and the continuing development of the safety and efficiency of the national air transportation system. Should we allow the sizeable reductions in the FAA budget to proceed either as proposed by the Administration or through an unfortunate sequestering process as enacted under the Gramm-Rudman-Holling Act, we will in effect abandon the National Airspace System Plan as a cohesive, organized and systematic approach to solving rapidly growing safety and capacity concerns.

This potential budget crisis is the culmination of almost ten years of broken promises by Administrations and Congresses to fully support aviation requirements through user generated taxes. It is apparent that even the provisions of law contained within the current trust fund legislation have not prevented a continuing attack upon yearly aviation appropriations. We must take whatever action is necessary to insure that monies appropriately generated through user contributions are fully spent in a timely manner to sustain and advanced the national air transportation system.

A funding level of $ 134.5 million for Research, Engineering and Development proposed for FY1987 represents a budget shortfall of $ 72.5 million, or a 54% reduction, in the Airport and Airway Improvement Act of 1982 authorizing legislation for FY1987 expenditures. Even more dramatic is the cumulative reduction of planned R, E and D expenditures which will amount to almost $ 150 million from 1982 through 1987 if the Administrations FY1987 budget is approved.

The effects of these cuts are twofold. First, FAA must re-evaluate the priority of NAS program development. Roadmaps designed in conjunction with planned system development dating back to 1981 to coordinate over 90 diverse programs and projects must be abandoned to choose which projects must be continued and which projects must be delayed or even abandoned. Because FAA will be struggling within these fiscal constraints, it is likely that those projects which will maximize benefits to the FAA will receive priority considerations, while those projects developed to support user requirements may be severely derogated.

The second major concern is that almost all initiatives for safety and capacity improvements find their genesis in the FAA R, E and D budget. Without the necessary R, E and D we are neglecting the future of the national air transportation system. As FAA has previously testified[1] almost 70% of its planned FY1987 R, E and D budget will support only four major programs. The remaining 30% of the R, E and D budget falls well short of supporting almost 100 R, E and D projects identified in the FAA and aviation industry coordinated Plan for Research, Engineering and Development published only six months ago.

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[1] House Appropriations Subcommittee ; April 16, 1986

Conceptually R, E and D provides the opportunities to expand aviation frontiers by generating and developing ideas then testing and evaluating those ideas. Not all concepts will survive. Not all programs will be problem free. This is exactly the nature and purpose of the R, E and D process. The development of the NAS Plan reflects this mixture of success and disappointment.

The initial intent of the iterative NAS Plan structure was to recognize R, E and D risks and the dynamic environment of changing requirements and technology. While the original concepts, priorities and technologies of 1981 for the NAS Plan may have mutated, the need for a modernized air transportation system is even greater now than in 1981. Although future benefits may be hard to identify, future costs will become intolerably high if a timely modernization of the system does not proceed.

The FAA advanced automation system remains the keystone of modernization in developing air traffic control safety and efficiency. There are obviously alternatives to FAA's chosen path for the development of this system. However, timely implementation of this program is a critical consideration. Everyday of delay adds risks and costs of growing demand, increasing delays, aging equipment and changing workforce demographics.

An independent study of AAS cost and benefit, which was funded by Congress, is to be completed within the next 10 months. Until this report is presented, RAA strongly urges a continuation and funding of the AAS program as proposed by FAA.

Before concluding my remarks, I would like to briefly address some specific areas of interest and concern.

Although the National Airspace System Plan outlines a systematic and iterative approach to the development of the national airspace system, additional flexibility is needed within this plan to cope with changing requirements and technological opportunities. These issues focus upon both FAA policy and fiscal management.

FAA must exploit commercially available products and services when and where benefits will be rapidly realized. This opportunity exists in areas of rapidly changing technology and application of technology where private enterprise is not constrained by the traditional federal process of procurement that often results in out-of-date products being delivered. Alternatives, such as equipment leasing, should also be considered to support these types of commercial products as well as considerations for satisfying interim system and transition system needs as NAS modernization proceeds.

In conjunction with increased flexibility for system development, limited discretionary funding should be made available for R. E and D work which can be accomplished in less than three years on an FAA departmental basis. This type of funding availability with proper oversight would encourage innovation to rapidly solve time critical problems which often develop in a dynamic service environment.

Lastly we would encourage the FAA to undertake more joint development and evaluation with the users of many of the NAS Plan initiatives to resolve perceived or actual problems and insure that those plans do in fact contain the safety, capacity and cost benefits stated or implied. Programs such as TCAS, AWOS, MLS, etc. could benefit greatly from increased field participation by the aviation user community.

Mr. Chairman, this concludes my remarks. I will be happy to answer any questions you have at this time.

Mr. **Brown**. Thank you very much. Mr. Packard, do you have any questions?

Mr. **Packard**. Yes, Mr. Chairman. Mr. Sheehan, you mentioned the obsolescence of certain technologies in the NAS plan. Could you be more specific? Do you feel private sector is moving out in front of FAA on some of this technology.

Mr. **Sheehan**. Let me answer your second question, first. Yes, I believe that the private sector has the answer in several of the technologies that the FAA is trying to do. I guess the best example is I come back to the thing that gives us the greatest heartburn is our automated flight service station system. We have had, for the last 4 years, at least six commercial vendors of some very sophisticated weather services, both graphics and good alpha and numeric information that is packaged quite well.

The FAA has been aware of this obviously, because those private vendors have beating on FAA's door actively for about 2 years now. The FAA seems to have the not-invented-here syndrome, saying, "Don't bother me; I'm working on my own system. When I get my system finished, I'll compare it with yours," which we feel is very short-sighted.

The other technology that we are seeing to be the wildmen of the industry and the community out here to be talking about is in terms of advanced automation in the air traffic system. We are convinced that much before the 21st century we will have a satellite-based ATC system. We are being pressured by many other countries in the world. The FAA is now playing catchup ball to come up with their system of how we would envision an ATC system that is satellite based.

There are commercial vendors out there also—other foreign nationals out there with systems that have prototypes working today, and are nibbling away at the edges of technology that I think is going to be foisted upon us in the early 1990's unless we get on the band wagon now. We would like to see the advanced automation concept directed towards ATC satellites and to work with some of the commercial vendors out there that have those good ideas.

Mr. **Packard**. Do you think that part of the FAA strategy is to make a system flexible or their plan flexible enough to eventually pick up some of this merging technology?

Mr. **Sheehan**. No; in fact we feel just the opposite. We feel that when the Brown book, the NAS plan, was delivered to us in the early 1980's, it was delivered to us as a package, a very intricately connected package that would only work if all elements of that package came together in precise, exact fashion. We have seen that this hasn't happened, and that flexibility that you talked about has not been built in there. This is one direction we would like to see the FAA begin to pursue in all its R&D efforts to accommodate new technology, to accommodate entrepreneural ideas and to look at more modular systems.

Mr. **Packard**. Ms. Deegan, you recommended exploiting commercially available products. Could you be more specific on how—I presume you are talking about off-shelf commercially available products and services?

Ms. Deegan. Yes. If you wouldn't mind, I would like to refer to our technical advisor on this issue which is Gary Church, to answer the question directly.

Mr. Packard. All right.

Mr. Church. Thank you, Mr. Packard. Mr. Sheehan covered a number of areas that are of interest especially in the commercial weather area there are opportunities. We also have opportunities within the FAA on programs that have been suspended in an anticipation of NAS plan developments. There seems to be some opportunity for creative financing and interim systems on lease basis to give a stopgap improvements and capacity without abrogating some of the longer term technological developments within the system.

These seem to be relatively productive ideas that we would like the FAA to explore in great sincerity.

Mr. Packard. I presume, Mr. Gammon, that you feel the same way; that we could use more off-the-shelf technology and integrate that into the system; is that correct?

Mr. Gammon. Yes, I do, I think one of the problems that we are faced with and that the FAA is faced with a lot of times is the requirements that they see, both in the NAS plan and also the internal requirements that they start to develop when developing a program like a weather program—start to put more demands on it, and they are forced to look inside.

The problem with looking inside in today's advancing technology is that once it is developed, it is usually outdated by products that are available on the shelf, and I think the weather dissemination program, as has been indicated before and in our experience with it would indicate that it does produce a product, and it produces it to the user, and one that can be utilized, and again it is not something that we are replacing the flight service station with. It is a supplement to that.

Mr. Packard. You feel it would both save money and also speed up the process.

Mr. Gammon. Oh, I firmly believe that.

Mr. Packard. Thank you very much, Mr. Chairman.

Mr. Brown. Mr. Lewis.

Mr. Lewis. Thank you, Mr. Chairman.

Mr. Gammon, FAA has taken the position that not only PAPI should be funded in the Airport Improvement Program, do you support FAA's position in this area?

Mr. Gammon. That's, I think, a decision that was made to try to be uniform across the scope of approach lighting systems. I guess I would say that I agree with uniformity. However, I am not so sure that approach light systems are something that the difference is going to be that noticeable. As a pilot myself in using those systems, I personally don't have a problem in using different types of systems, and we do it in other areas, too. So I guess I am going to cut the line there and say, yes, uniformity is good, but in this particular case I'm not so sure it is absolutely needed.

Mr. Lewis. Mr. Sheehan, would you comment on FAA's policy and approach on PAPI?

Mr. Sheehan. I'd be glad to. I guess to give a little bit of background, for instrument approach lighting systems, and this is obviously something different from the glide slope indicator that you get out of a PAPI or a PLASI or a VASI. The instrument approach lighting systems that help you acquire visual contact with a runway on an instrument approach now number, I believe, about 14 different types. You have a little symbol on your approach plate that you look at so you can know what to anticipate when you break out and see the runway or the approach lights.

For that reason alone, I don't see where standardization is going to be that critical. If they want to standardize, they can meet their international commitments, and there is an ICAO commitment to that, by the way, to standardize with PAPI, but you only need to do that to the 40 international airports in the United States. The rest of the airports should have the option of funding either PAPI or PLASI through the trust fund.

Mr. **Lewis**. You answered my question because PLASI was Federally funded, then again it was taken off, and it was also available for non-Federal.

Mr. **Sheehan**. Right.

Mr. **Lewis**. Thank you, Mr. Chairman.

Mr. **Brown**. Mr. Gammon, you have indicated, I think, you support taking the trust fund off of the budget. I would like to inquire just how much the States have gotten involved in doing that. This is going to be a difficult political problem more than anything else. There is no real reason why it shouldn't be done.

My observation is the States have spent a lot of time lobbying for revenue sharing, for example. I haven't seen as much activity in connection with this, although I am not at all sure what something like this would benefit the States more than a continuation of revenue sharing.

Mr. **Gammon**. Well, my feeling is, of course, being from the transportation side and the aviation side, as I mentioned before, I know that the transportation organizations of the State fully support this, both on the highway and the airport side, pulling both the trust funds off the budget, and I would have to believe that the rest of the State organizations are going to go along with that, too. But I am only going to refer right now to the transportation organizations and related affiliations that I know have in their policy statements something to do with taking trust funds off budget.

Mr. **Brown**. Yes; I am not going to pursue this any further. We have another meeting of the full committee members at 11 o'clock, so if we can ask you any additional questions in writing, we will relinquish you at this time and thank you very much for your cooperation.

The subcommittee will resume with our third panel this afternoon at 1:30.

[Whereupon, at 11:15 a.m., the subcommittee was recessed t resume this same day at 1:30 p.m.]

AFTERNOON SESSION

Mr. **Brown**. The subcommittee will come to order. We apologize to the witnesses for shortchanging you this morning on time, and having you back this afternoon, and we appreciate your cooperation with us. We have Mr. Jack Howell who is vice president for air traffic of the Airline Pilots Association; and Suzette Matthews, general counsel of the Air Traffic Controllers Association.

You may present your statement, Mr. Howell, and as you know, the full text will appear in the record if you should wish to abbreviate it in any way.

STATEMENTS OF JACK HOWELL, VICE PRESIDENT, AIR TRAFFIC, AIRLINE PILOTS ASSOCIATION, AND SUZETTE MATTHEWS, GENERAL COUNSEL, AIR TRAFFIC CONTROL ASSOCIATION, INC.

Mr. **Howell**. Thank you, sir, I shall do so. First of all, my fellow pilots and I appreciate the opportunity to comment on the fiscal year 1987 FAA research, engineering and development budget request, and we commend you for holding this hearing.

We are all aware that the magnitude and success of the FAA Research, Engineering and Development Program is directly associated with the availability of moneys currently in the Aviation Trust Fund. This fact is yet another reason why we believe that every possible effort should be made by the Congress to remove the trust fund from the general fund and to use its assets for the purpose for which they were collected: the improvement of air safety in the United States. We believe the amount currently contained in this fund, plus the continuing income at the existing level, should be adequate to support aviation requirements for years to come.

Now, if we return to the situation today and look at how short-term funding should be allocated for research and development purposes, we hope that those responsible for requesting and issuing such funds will take time to reflect on the current problems in the national airspace system.

One, the number of airlines operating in the national airspace system has increased approximately 122 percent since 1979.

Two, the number of airports and available landing surfaces for air carriers has not increased since that time, though even in 1979 traffic delays existed due to airport acceptance constraints.

Three, the number of near misses and operational errors has increased significantly.

Four, weather-related accidents still plague the aviation industry.

Five, terrorism is on the increase.

I am sure that everyone associated with aviation would like to see rapid progress on the national airspace system plan. Certainly our members would because we believe the majority of NASP programs are essential if the long-term configuration of the system is to accommodate the future growth of aviation safely, efficiently, and economically. However, because of the constraints of the current fiscal environment, we know this is not possible. Therefore, we believe it is imperative that the available funding be allocated in the following order of priority:

First and foremost are programs directly related to aviation safety. These would include the continued development of reliable airborne and ground windshear detection system, the completion of a truly effective airborne collision avoidance system program, and the development of methods to detect the various types of explosives that can be placed aboard civil aircraft. Equal attention should be afforded to needed crash protection and survival enhancements, cabin safety improvements, and a means to ensure the timely dissemination of severe weather information to aircrews.

In our statement submitted for the record we have attached a more comprehensive list of the programs we believe deserve priority consideration. Second, our programs directly intended to increase system efficiency.

Since airport capacity is the limiting factor for traffic growth, efforts should be pursued to improve existing airports for more and better utilization. This would include programs such as the detection, avoidance, and possible elimination of wake vortices; improved airport design and configuration; and the development of more effective lighting and visual guidance systems.

In addition, other operational concepts are now being tested, such as independent approaches to closely spaced parallel runways and triple independent and dependent IFR approaches. Because of their critical nature, these proposals need much more extensive testing to demonstrate their safety prior to implementation and certainly before endorsement by our association.

As a last priority are programs whose purposes are only to provide some degree of economic return. A classic example of such a program is the proposed reduction of vertical separation above 29,000 feet. To date, no figures on the cost savings to users nor any proof of improved efficiency of the ATC system have been provided by the FAA, even though this program has been in existence for 4 years. In our opinion, if this project is implemented, it could actually reduce the level of safety we currently enjoy in the operating environment above 29,000 feet. Programs such as this should not be funded until those of higher priority cited earlier have been completed.

As for committing funds to the development of the Advanced Automation System, ALPA believes that the entire program is so broad and conceptual it is difficult to comprehend fully its benefits, particularly those dealing with the advanced automated enroute ATC, the AERA portion. Our opinion today is that we have not been provided enough information by the FAA to make an appropriate decision.

We do, however, strongly support the ongoing Host Computer Program because of its ability to provide enroute metering, and conflict alert and resolution. These are features that add to both safety and efficiency. But, Mr. Chairman, we cannot in good conscience recommend that the Advanced Automation System receive research and development funding on a level consistent with higher priority programs. Instead, its development should be at a measured pace, ensuring that it will indeed provide the operational benefits at an acceptable cost.

In summary, Mr. Chairman, we sadly believe the traveling public feels that aviation safety is at a minimum today, and that it will not tolerate any further reduction. We urge you and your colleagues to consider seriously the priorities of safety, efficiency, and economy as we have proposed to you today.

This concludes my prepared remarks, and I would be pleased to answer any questions.

[ALPA's prepared statement follows:]

STATEMENT of

HENRY A. DUFFY, PRESIDENT

AIR LINE PILOTS ASSOCIATION

before the

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

April 22, 1986

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Mr. Chairman and members of the Subcommittee, I am Henry A. Duffy, President of the Air Line Pilots Association. Accompanying me today is John O'Brien, Director of our Engineering and Air Safety Department. ALPA represents the professional interests of 34,000 members who fly for 49 airlines.

We appreciate the opportunity to comment on the FY 1987 FAA Research, Engineering and Development budget request, and commend you for your insight in holding this hearing for the purpose of obtaining views from members of the aviation community.

We are all aware that the magnitude and success of the FAA Research, Engineering and Development programs is directly associated with the availability of monies currently in the Aviation Trust Fund. This fact is yet another reason why we believe that every possible effort should be made by the Congress to remove the trust fund from the general fund and use its assets for the purpose for which they were collected: the improvement of air safety in the United States. We believe the amount currently contained in this Fund, plus the continuing income at the existing level, should be adequate to support aviation requirements for years to come.

Now, if we return to the situation today and look at how short-term funding should be allocated for research and development purposes, we hope that those responsible for requesting and issuing such funds will take time to reflect on the current problems in the National Airspace System (NAS). If they do this, the following facts will be evident:

1. The number of airlines operating in the NAS has increased approximately 122 percent since 1979.

2. The number of airports and available landing surfaces for air carriers has not increased since that time, though even in 1979 traffic delays existed due to airport acceptance constraints.

3. The number of near misses and operational errors has increased significantly.

4. Weather-related accidents still plague the aviation industry.

5. Terrorism is on the increase.

I am sure that everyone associated with aviation would like to see rapid progress on the National Airspace System Plan (NASP). Certainly our members would, because they believe the majority of NASP programs are essential if the long-term configuration of the system is going to be able to accommodate the future growth of aviation safely, efficiently, and economically. However, because of the constraints of the current fiscal environment, we know this is not possible. Therefore, we believe it is imperative that the available funding be allocated in the following order of priority:

1. First and foremost, to programs directly related to aviation safety. These would include the continued development of reliable airborne and ground windshear detection systems, the completion of a truly effective airborne collision avoidance system program, and the development of methods to detect the various types of explosives that can be placed aboard civil

aircraft. Equal attention should be afforded to needed crash protection and survival enhancements, cabin safety improvements, and a means to ensure the timely dissemination of severe weather information to aircrews.

Attached is a more comprehensive list of the programs we believe deserve priority consideration.

2. For programs directly intended to increase system efficiency. Since airport capacity is the limiting factor for traffic growth, efforts should be pursued to improve existing airports for more and better utilization. This would include programs such as the detection, avoidance, and possible elimination of wake vortices; improved airport design and configuration; and the development of more effective lighting and visual guidance systems. In addition, other operational concepts are now being tested, such as independent approaches to closely spaced parallel runways and triple independent and dependent IFR approaches. Because of their critical nature, these proposals need much more extensive testing to demonstrate their safety prior to implementation and certainly before endorsement by our association.

3. As a last priority, for programs whose purpose is only to provide some degree of economic return. A classic example of such a program is the proposed reduction of vertical separation above 29,000 feet. To date, no figures on the cost savings to users nor any proof of improved efficiency of the ATC system have been provided by the FAA, even though this program has been in existence for four years. In our opinion, if this project is implemented, it could actually reduce the level of safety we currently enjoy in the operating environment above 29,000 feet without increasing

should not be funded until those of higher priority listed in 1 and 2 have been completed.

As for committing funds to the development of the Advanced Automation System, ALPA representatives testifying before congressional committees on prior occasions have stated that the entire program is so broad and conceptual it is difficult to fully comprehend its benefits, particularly those dealing with the advanced automated enroute ATC (AERA) portion. Our opinion is unchanged today as we have not been provided any additional information by the FAA. We do strongly support the ongoing Host computer program because of its ability to provide enroute metering, and conflict alert and resolution. These are features that add to both safety and efficiency. But, Mr. Chairman, we cannot, in good conscience, recommend that the Advanced Automation System receive research and development funding on a level consistent with higher priority programs. Instead, its development should be at a measured pace, ensuring that it will indeed provide the operational benefits its sponsor says it will and at an acceptable cost.

In summary, Mr. Chairman, we strongly believe the traveling public feels that aviation safety is at a minimum today, and that it will not tolerate any further reduction. We urge you and your colleagues to consider seriously the priorities of safety, efficiency, and economy we have proposed to you today.

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ATTACHMENT

AVIATION SAFETY PROGRAMS REQUIRING CONGRESSIONAL SUPPORT

It is the opinion of the Air Line Pilots Association that for a number of reasons the FAA has not been provided with the resources necessary to carry out its basic safety mandate. This has led to the establishment of priorities, based on inadequate funding levels, which have not in all cases been in the best public interest from a safety perspective. To remedy this situation, Congress must: (1) appropriate funds in an amount which will provide necessary resources, (2) provide directives to FAA where necessary so that proper priorities will be established in view of the difficult funding problems which exist today, and (3) create legislation where funds and directives are not sufficient.

The following is a list of programs, projects or activities which need either funding, direction, legislation or some combination thereof in order to best represent the public interest.

RESEARCH AND DEVELOPMENT

Research and Development funding is taken from the Aviation Trust Fund which is entirely derived from user taxes. In 1981 as part of a five year spending plan, congress authorized $215 million for 1986; however, as a result of budget deficits in 1985/86, congress passed a continuing resolution for expenditures for only $190 million. Should the Graham/Rudman cuts materialize, the spending limit could drop to $181 million, which in our opinion is not adequate to continue necessary research and development programs currently underway.

In 1987, congress authorized $193 million but again, this has been reduced by the President's budget proposal to $134 million. In our opinion, this will result in drastic measures being taken by the FAA to stay within these funding levels. With this in mind, we feel that certain programs, such as those listed below should be given special consideration and be immune from further reduction.

1. Traffic Alert and Collision Avoidance System (TCAS)

   The development and implementation of an effective airborne collision avoidance system is long overdue and needed now more than ever. This system is not dependent upon the ground-based air traffic control system. The TCAS system currently under development is only marginally effective and will not provide the aviation public the degree of safety that today's technology permits. This system is known as TCAS II and provides only vertical escape maneuvers. Another system under development is TCAS III, which offers more accurate information than TCAS II, provides both horizontal and vertical escape maneuvers, and reduces the number of unnecessary alarms. Clearly the improved TCAS III system is more appropriate for airline installation, primarily because of the increased accuracy and the addition of a horizontal escape maneuver, which would be more effective in preventing a collision at both high and low altitudes. We feel that congress should direct the FAA to implement, as quickly as possible, a collision avoidance system with horizontal as well as vertical escape maneuvers.

2. Human Performance Research

In order to help ensure safety in our nation's aviation system, it is important to understand areas where human shortcomings may lead to problems, incidents, or accidents. The FAA is attempting to address these issues through selection, hiring, and operational practices for its employees. Pilots are the other half of the important safety equation. The FAA published a Cockpit Human Factors Plan in January 1985 that is designed to investigate human interface with an automated air traffic control system and highly automated new aircraft. The FAA has begun to address several operational safety issues identified by this plan, and more will be studied at a later date. Rather than curtail these important human interaction safety studies, we feel the FAA should proceed with its plan with increased vigor and commitment. One of these issues being studied is an investigaiton of the operational implications of failures in automated aircraft systems and the impact of reversion to manual control. These safety studies will yield important immediate operational safety gains and continue to pay safety dividends in the future.

3. Runway Friction Measurement

At the present time a pilot landing or taking off on a runway contaminated with snow, ice, or slush must rely primarily on other pilot reports as to the condition of that runway and the ability to stop on that runway. These pilot braking action reports are very subjective because the reporting aircraft could be a different model - lighter/heavier, faster/slower, etc. There have been many instances in which aircraft went off runways because the flight crew had inadequate information on the stopping condition of the runway. Therefore, there is a need to determine if the presently available friction measurement vehicles are sufficiently accurate, under winter contaminated conditions, to be used to give runway friction measurement information to a flight crew. These vehicles have proven themselves to be very useful to the FAA and an airport operator in ensuring that the runway is maintained to a satisfactory dry/wet level of friction. We must now expand this knowledge to determine the vehicles' reliability under winter conditions. Such a Research and Development program is approximately fifty per cent complete. Since this program involves both ground vehicles and large transport aircraft (B-727 and B-737), congress should either earmark or recommend that $500,000 be spent each year, for the next four years, in order to complete this project.

AVIATION STANDARDS

Even though FAA Operations and Maintenance will receive a slight increase in the 1987 proposed budget, there are some programs in this proposed budget area that will face cuts. There are many programs in Aviation Standards funded through the FAA Operations and Maintenance budget that have a direct impact on aviation safety and therefore, cannot withstand reduced funding levels. We have provided two examples of programs where increased funding is necessary if the current level of safety is to be maintained.

1. Flight Inspection and Procedures Program

Quality and up-to-date instrument flight procedures are absolutely necessary to provide the maximum degree of safety in our airspace system. This becomes especially critical in the approach, missed approach, and departure segments of instrument flight procedures. We are aware that the procedures sections in the Flight Inspection Field Offices are understaffed and are experiencing difficulty in keeping up with the ever-increasing workload. At present, a large percentage of the specialists who are assigned to develop and maintain instrument flight procedures are trainees. We further understand that formal FAA Academy training in procedures development has already been deleted because of existing budget constraints. This means that the experienced procedures specialists must devote valuable production time to training. This situation has unsafe side effects. ALPA pilots have been reporting a proliferation of lengthy Notices to Airmen (NOTAMS) which are difficult to sort out in the cockpit environment and which contain an abundance of very critical procedure changes. At a high density airport, such as Chicago's O'Hare, it is not unusual to have very long, wordy changes to several procedures for several runways. Many NOTAMS are intended to be temporary, but they remain in the system for months and even years. We believe that the procedure specialists are forced to resort to issuing an excessive number of NOTAMS and permitting them to remain in effect for an intolerable length of time because of being understaffed, heavy with trainees, and having inadequate resources to process new or revised procedures in a timely manner. We may be faced with the cancellation of existing procedures and/or a freeze on the development of new procedures. This would have a disasterous effect on the safety of instrument flight operations.

Since as early as 1975, those responsible for the FAA Flight Inspection and Procedures Program have been cutting expenses in a very dynamic manner. They have consolidated Flight Inspection Offices, reduced their aircraft fleet, and established an automated flight check system that permits flight checks in instrument weather conditions. However, flight inspection has reached a point where further cutbacks could result in a deterioration of the navigation system as we know it today. Just as the development of new procedures might have to be halted for the lack of an adequate number of experienced specialists, the Flight Inspection Offices might have to shut down navigation facilities and have procedures canceled due to the lack of resources to permit flight checks. Duplicative procedures now published (such as for noise abatement) may have to be canceled for lack of available flight hours. Periodic flight checks of ILS, MLS, VOR, and NDB navigational aids may have to be conducted less frequently. This development would be unacceptable. Also, the thoroughness of the flight check and some of the parameters tested might have to be reduced. This is unacceptable from a safety point of view.

Instead of a reduction in outlay, congress should direct the FAA to increase the staffing and training of procedures specialists and provide sufficient funds to ensure that both the development and maintenance of instrument flight procedures and the flight inspection of navigation aids be supported at a level that will guarantee no derogation of our airspace system and that will accommodate future developments as modern technology overtakes today's state of the art.

2. Aircraft Certification Standards for New Technology Aircraft

Present regulations dealing with certification of air carrier aircraft do not address some of the systems and concept being proposed for the next generation of aircraft. Systems such as fly by wire, fly by light, active controls, reduced static stability, side stick control and associated new cockpit instrumentation, where the aircraft to a greater or lesser extent is being controlled by computers, have appeared only on certain military aircraft where mission requirements dictated such systems. In many cases these automatic systems are still in the military research and development area. However, several manufacturers are proposing that these exotic systems be standard on air carrier aircraft scheduled to be flown and certificated within the next two to three years. At the present time, the expertise in these fields is at the industry level, not at the regulatory level. Therefore, the FAA is dependent upon the respective manufacturer for certification guidance which is a very questionalbe role reversal

Therefore, if the FAA and the certification regulations addressing such systems are to keep pace with these advancements, it is imperative that funding be approved to allow FAA personnel to investigate these systems and concepts.

AIRPORTS

The Airports Division of FAA are responsible for inspecting, certificating and overseeing the improvements and expenditures of airports through the Airport Improvement Program (AIP)

1. Airport Inspections

Inspection of the 701 air carrier airports is a vital link in the level of safety expected of air carrier operations. The source of funding for these inspections is the FAA Operations General Funds which are programmed to be reduced by \$55 million in 1986. In addition, if the proposed Gramm-Rudman cuts are accepted, the FAA Operations General Fund will be reduced by an additional \$100 million.

The immediate effect of such a cut is to discontinue that portion of the airport inspections conducted under contract by the states. The purpose of these inspections is to gather technical data used by pilots, FAA, military, etc., on obstructions; physical data, i.e. grooving of runways, lighting, marking and other visual aids and navigation aids. It is this information that is shown on approach plates, charts, and maps used by pilots and air traffic controllers.

The secondary effect of the noted cuts is an overall reduction - estimated to be fifteen percent - in the number of FAA airport inspectors. The FAA inspector's role is to assure compliance with the Federal Aviation Regulations concerning such subjects as snow removal, adequacy of fire and rescue facilities, security, condition of visual aids, runways, and taxiways.

The loss of, or reduction in, these two inspection programs for air carrier airports will have an immediate impact on the level of safety of air carrier operations. The most critical loss is the technical inspections. Without the data gathered by these inspections, pilots will not have current and vital information concerning the physical characteristics of the airport into which they operate.

Although there is a proposal to increase the FAA Operations budget for 1987, those increases are slated to expand the Air Traffic Controller, Air carrier and General Aviation Inspection forces. None of the increases will be used to recuperate the loss in airport inspectors caused by the dramatic reductions in the operations budget for 1986. This is ironic - along with being depressing - when you consider that the FAA, in response to the NTSB and industry, is in the process of improving the regulations dealing with airport certification. In other words, at a time when FAA is bolstering the airport regulations - regulations that will require additional monitoring and inspections - the government is forcing the FAA to make drastic cuts in the personnel necessary to conduct those inspections.

2. Airport Improvement Program (AIP)

The Airport Improvement Program funds are used for such diverse items as purchase of rescue and fire fighting equipment, snow removal equipment; visual aids, such as runway and taxiway lights, rotating beacons and marking of obstructions; security fencing; runway overlaying and grooving in order to improve drainage and assist the pilot in bringing an aircraft to a halt on a runway. Prior to 1986, it was determined that in order to fund those safety improvements necessary for 1986, $1,017 million would be required. This value was reduced to $925 million by the Continuing Resolution and reduced even further to $885 million by the Gramm-Rudman legislation. Furthermore, it was also determined that AIP funding for 1987 should also be $1,017 million. However, this amount was reduced to $712 million.

In summary, at a time when, due to deregulation, traffic at air carrier airports is increasing appreciably and resulting in a need to add safety improvements, the funding for these improvements is being reduced by 13% for 1986 and 30% for 1987. This is because the AIP has been dealt the greatest reduction in funds except for the F&E funding.

Therefore, since congress has mandated that all air carrier airports be inspected on a regular basis and has recommended and mandated that the FAA improve airport safety, it is imperative that the funds for airport inspections and improvements through the AIP be restored. If not, the weakest link in the system will be the air carrier airports.

LEGISLATION

Protection For Pilots, Flight Attendants, Mechanics, Airport Employees Who Report FAR Violations

There presently is no protection for an employee of a FAA certificated operation, i.e. airline, maintenance/overhaul base, airport, when that employee correctly informs the FAA that his employer is conducting business in violation of the Federal Aviation Regulations (FARs). There are some regulations that are so worded that they make both the employee and employer responsible for complying with the regulation. In these cases, an employee who insists on complying with the regulation when his employer would prefer not to comply is again putting his job in jeopardy.

Therefore, there is a need for legislative action to establish a law similar to the "whistle blower" law for federal employees that would protect airline and airport employees when they report violations of the FARs by their employer.

Mr. **Brown**. We'll have Ms. Matthews make her statement first, and we will include the supplements that you have with your statement as a part of the record also.

Ms. Matthews.

Ms. **Matthews**. Mr. Chairman and members of the subcommittee, I am Suzette Matthews, general counsel to the Air Traffic Control Association. ATCA is a professional association which has its goal advancements in the science and profession of air traffic control and aviation safety. ATCA's membership consists of air traffic controllers and managers, flight service specialists, airway facility technicians, pilots and other persons, corporations and organizations engaged in development, production, operation, maintenance and use of our national airspace system.

I have with me today ATCA members James R. Banks and Charles Varnell—they are behind me to my left—both of whom are consultants specializing in the technology of air traffic control.

We appear before you today to provide our insight and views on the process and progress of NAS modernization and our perceptions about the potentially devastating effects that declining funding for FAA programs, particularly the administration's proposed fiscal year 1987 budget request for FAA are having and will have on timely completion of NAS modernization and operations of the air traffic control system.

Also we will address the benefits and progress of FAA's largest NAS project, the advanced automation system. ATCA has prepared comprehensive written remarks which I would like to submit for the record, and at this time provide a summary of our views.

Mr. **Brown**. Without objection.

Ms. **Matthews**. ATCA urges Congress and the administration this year to renew our commitment to modernization of our national airspace system as a critical national priority. The volume of air traffic using our air traffic control system is spiraling. FAA projections forecast that by 1997 traffic handled by FAA's ATC towers and centers will increase 46 and 39 percent, respectively, over the volume accommodated in 1985.

The system operated today was not designed to, and cannot, accommodate the level of traffic forecast for the future. Due to the current ATC system's evolutionary genesis, its equipment is an aging mixture of varying technological generations. It is expensive to operate and maintain. Its expansion capability and adaptability to change is limited, and it is not equipped to exploit the productivity and economies available through automation.

In our judgment, FAA's national airspace system modernization plan now underway contains technically sound programs for development and acquisition of equipment and technology which will increase safety and productivity in the system, achieve economies not heretofore available, and create a structure capable of accommodating traffic forecast for the future.

The money needed to achieve these objectives is collected in the aviation trust fund and available for those stated purposes. In light of the benefits to be achieved, and the availability of the means to do so, ATCA strongly recommends that the administration and Congress push forward as expeditiously as possible with completion of the plan. Moreover, in light of the needs being addressed by the

NAS plan, ATCA submits that there are no reasonable or viable alternatives.

Timely implementation of NAS plan improvements is threatened today by underfunding. During the period 1982 to 1987, NAS plan appropriations cumulatively have lagged $1.67 billion behind the authorized level. The administration's fiscal year 1987 budget proposal accelerates that trend. Amounts included for NAS plan expenditures are $703 million or approximately 30 percent below the authorized level, which would bring the cumulative funding shortfall to $2.3 billion. Most critically, we understand that the administration's $825 million request for F&E—facilities and equipment—expenditures in fiscal year 1987 is $602 million, or 42 percent, less than the amount necessary to meet the requirements of the NAS plan as revised in 1985.

Although in hearings on the fiscal year 1986 budget, FAA predicted that the NAS plan would remain essentially on schedule despite funding reductions to below authorized and requested levels in fiscal year 1986, this optimistic forecast presumed recovery through higher spending levels in immediately subsequent years–specifically, an appropriation over $1 billion in fiscal year 1987, reaching $1.6 billion during the fiscal years 1988 and 1989. This drastic reduction in NAS plan funding, should it be permitted to occur, would have disastrous effects upon the progress of NAS modernization.

Already, program schedule adjustments, including those due to insufficient funding in previous years, have eroded the expected NAS plan dollar benefits to be achieved during the 1981-2000 period, from the $18.3 billion projected in 1985 to approximately $16.5 billion. Meanwhile, FAA may be forced to take some vital NAS projects off full funding in order to initiate other critical improvements, placing all of these projects at risk of incompletion.

Other projects such as the long range radar, scheduled for 1987 contract award, will be pushed into future years, thereby foregoing the benefits and economies otherwise available through modernization. Most critically, ATCA fears that underfunding will slow or destroy the momentum of the advanced automation system, or AAS. The largest single component of the NAS plan, AAS involves development of a total automation system for air traffic control, including new controller work stations or "sector suites," and new software, including advanced functions.

Implementation of AAS will increase safety, controller productivity, capacity and economy. In addition to productivity and capacity gains, AAS is a prerequisite to consolidating over 200 ATC facilities operating today into approximately 23 area control facilities, achieving economies of scale and operations heretofore impossible. We submit that the development and implementation of AAS under current schedules is absolutely critical to maintaining safety and efficiency of NAS, while at the same time accommodating spiraling future traffic demands.

Although the new host computer using existing rehosted software is expected to provide limited computer capacity increases in the short run, providing critical ATC service to the significantly increased traffic projected into the next century in a cost-effective way is directly dependent upon application of the advanced automation capabilities represented in the AAS Program.

ATC strongly urges against delaying the acquisition phase of AAS as suggested by GAO in its June 17, 1985 report. More extensive testing by both contractors prior to the acquisition phase would be extremely costly, requiring both DCP contractors to develop a demonstrable system, only then to discard half the effort. ATCA strongly supports testing of AAS and the AERA air functions during the acquisition phase wherein capabilities to implemented first are tested, rather than delaying the entire program for the tested functions to be implemented much later.

Having addressed the crisis to our national airspace system and NAS modernization posed by the administration's fiscal year 1987 budget request, ATCA strongly supports a two-pronged solution. First, ATCA urges support of legislation pending before both Houses of Congress which would separate the aviation trust fund from the annual Federal budget process. This would help to assure that funds raised from aviation users specifically for airport and airways improvements would be expended for those stated purposes.

Second, ATCA urges Congress to make increased funding for FAA, and NAS modernization in particular, a special priority. Americans are concerned about safety and efficiency in air transportation. They support Federal programs designed to improve our air transport system, and we believe they are willing to have user taxes spent for those purposes. ATCA urges Congress to appropriate the full amounts authorized for NAS modernization in fiscal year 1987 by the Airport and Airway Improvement Act of 1982.

Thank you for the opportunity to express these views. If you have any questions, Mr. Banks, Mr. Varnell, and I will try to answer them for you.

[The prepared statement of Ms. Matthews follows:]

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STATEMENT OF

SUZETTE MATTHEWS

ON BEHALF OF

THE AIR TRAFFIC CONTROL ASSOCIATION, INC.

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

April 22, 1986

dedicated to progress in the science of air traffic control

Mr. Chairman and Members of the Subcommittee, I am Suzette Matthews, General Counsel to the Air Traffic Control Association, Inc. ATCA is a professional association which has as its goal advancements in the science and profession of air traffic control and aviation safety. ATCA's membership consists of air traffic controllers, air traffic and flight service specialists, airways facilities technicians, pilots, and other persons, corporations, and organizations engaged in development, production, operation, maintenance, and use of our National Airspace System.

ATCA appears before you today to provide its insight and views on the process and progress of National Airspace System modernization, and the devastating effects that declining funding for FAA programs, particularly the President's proposed Fiscal Year 1987 budget request for FAA, are having and will have on timely completion of the NAS modernization plan, and operations of the air traffic control system. ATCA also will address the benefits and progress of FAA's largest NASP project, the Advanced Automation System.

NAS PLAN AS A CRITICAL NATIONAL PRIORITY

The Air Traffic Control Association urges Congress and the Administration to renew their commitment to modernization of our National Airspace System as a critical national priority.

During the next decade, we will experience spiraling demands upon the national air traffic control system. FAA forecasts that between 1985 and 1997, operations at towered airports will increase from 57.9 million to 84.5 million, or 46%. FAA forecasts activity at ATC Centers to increase from 32.7 million aircraft handled in 1985 to 45.3 million in 1997, an increase of 39%. Flight services rendered are forecast to increase from 52.9 million in 1985, to 72.4 million in 1997, an increase of 39%. See "FAA Aviation Forecasts, Fiscal Years 1986–1997," Report FAA–APO–86–1, pp. 77–79.

This rapidly increasing level of air traffic is being accommodated by air traffic control procedures and equipment developed in an evolutionary process over the past forty years. The resulting system, although the safest and most advanced in the world today, was not designed to meet the traffic demands placed upon it today, much less that forecasted for the future. Today's equipment is an aging mixture of varying technological generations. The system is expensive to operate and maintain; its expansion capability and adaptability to changing requirements is limited; it does not exploit the potentials of automation, which would improve productivity and economy.

Recognizing that capacity limitations of our National Airspace System could pose a near-term constraint on the nation's economic well-being and growth, Congress, in the Airport and Airway Improvement Act of 1982, directed the Administrator of the Federal Aviation Administration to formulate a National Airways System Plan, setting forth a ten-year, $1.69 billion investment program for research, engineering, and development, and $11.7 billion in improvements for airports and air traffic facilities and equipment. The cost of NAS modernization was to be paid by users of the system, through increased aviation fuel and ticket-waybill taxes, which would be collected from users and maintained in an Airport and Airway Trust Fund, to be expended exclusively for development and improvement of our National Airspace System.

In December 1981, the Federal Aviation Administration first chartered the "NAS Plan," a comprehensive blueprint for modernizing our Nation's air traffic control system–one of the largest public civil services provided by the Federal Government–with current technology and automation. Today, less than half-way through the ten-year capital investment period envisioned by Congress, over 69% of major NAS Plan projects are under contract; 84% of the entire effort is expected to be under contract by the end of Fiscal Year 1986. FAA is to be commended, not only for the technological innovation and vision which inspires the NAS Plan, but for its capable management of one of the largest civil capital investment programs in our Government's history. ATCA submits that ATC modernization was urgently needed when the NAS Plan was developed and is more urgently needed today; the Plan was, at its inception, and continues to be, technically sound and appropriate to the needs it addresses. Its completion will result in safety and capacity and productivity improvements to our National Airspace System which contribute immeasurably to the country's economic growth and well-being.

In its 1985 update to the NAS Plan, FAA estimated that the cost savings in AT system operations to be achieved through timely completion of NAS modernization would be $18.3 billion between the years 1981 - 2000, not to mention the additional benefits that the Nation would continue to reap from a modernized, efficient system into the next century. The providers of air transportation, the people who use air transportation, and the taxpayer will all reap benefits from modernization of the system.

ROAD TO CRISIS IN FY 87

In recent years, funds in the Airport and Airways Trust Fund, needed for NAS modernization, have not been appropriated and made available for the purposes intended.

During the period 1982 through 1986, funding appropriated for FAA Facilities and Equipment was nearly $1.2 billion, or 23%, short of levels authorized by the 1982 Airport and Airways Improvement Act. In 1986 alone, the F&E appropriation for FAA was $427 million, or 31%, below the level authorized. During the same period, appropriations for FAA Research, Engineering, and Development were $90 million, or 9%, below authorized amounts. The Airport Improvement Program has experienced similar funding shortfalls. During the period 1982 through 1986, funding for this program was $398 million, or 9%, less than the amount authorized in the 1982 Act. FAA has sustained these cuts even though the NAS Plan has been updated to include additional requirements such as Terminal Doppler Weather Radar (TDWR).

The Administration's Fiscal Year 1987 Budget request for FAA not only exacerbates the NAS Plan funding shortfall, but initiates an alarming downward spiral which threatens the very heart and life of NAS modernization. Although the 1982 Act authorizes $1.164 billion to be appropriated in 1987 for FAA Facilities and Equipment, the Administration has requested only $825 million—$339 million, or 29%, below the authorized level. Similarly, although the 1982 Act authorizes $193 million for FAA Research, Engineering, and Development, the Administration has requested only $134 million—$59 million, or nearly 31%, below the authorized level. For the Airport Improvement Program $712 million—$305 million, or 30%, below the $1.017 billion funding level authorized by Congress in the 1982 Act. Such drastic funding reductions in FY 87 (a total of $703 million in these three accounts), coming upon the heels of a cumulative total shortfall of $1.67 billion over the 1982–86 period, will have significant

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and, perhaps critical, negative effects upon forward momentum of NAS modernization.

In the case of FAA Facilities and Equipment, for example, the Administration's FY 87 Budget request is $605 million, or 42%, less than the amount necessary to meet the requirements of the NAS Plan, as revised in 1985; this compounds a funding insufficiency in FY 86 of $197 million, or 17%, vis-a-vis the 1985 Plan. Although, in hearings on the FY 86 budget, FAA predicted that the NAS Plan would remain essentially on schedule despite funding reductions to below authorized and requested levels in FY 86, this optimistic forecast presumed recovery through higher funding levels in the immediately subsequent years. Specifically, FAA expected an appropriation over $1 billion for F&E in FY 87, reaching $1.6 billion during FYs 88–89. Furthermore, as a result of adjustments to the NAS Plan made since its last comprehensive revision in 1985, FAA now anticipates a requirement of slightly over $12 billion for F&E through FY 92, rather than the $11.7 billion envisioned in the 1985 NAS Plan. Under the funding schedule now envisioned by OMB ($825 million in FY 86, leveling off at $1.164 billion in each of FYs 88–92), the NAS Plan will suffer a cumulative shortfall from required funding of $1.67 billion by 1992.

SPIRALING FUNDING SHORTFALLS WILL SERIOUSLY AFFECT FORWARD MOMENTUM OF THE NAS PLAN, PARTICULARLY THE ADVANCED AUTOMATION SYSTEM

Enactment of the Administration's proposed FY 87 funding levels for FAA not only will result in vital project delays, and thereby reduce benefits from NAS modernization, but will require changes in the way FAA plans procurement which could jeopardize completion of the NAS Plan.

Reduced appropriations for FAA Research, Engineering and Development and Facilities and Equipment in FY 86 already is taking its toll on NAS Plan projects. As a result of program schedule adjustments, including those due to insufficient funding, the expected dollar value of benefits to be achieved through NAS modernization during the period 1981–2000 have eroded from the $18.3 billion projected in 1985 to approximately $16.5 billion. This erosion of benefits can be expected to continue, and possibly accelerate if underfunding continues to cause delays in development and implementation of NAS.

Meanwhile, in order to meet deficit reduction goals while at the same time keeping major NAS Plan projects on track, FAA will be forced to depart from its traditional "full-funding" approach to new equipment purchases. Under the full-funding approach, project completion is assured by securing funds for the life of the project at the time of initial investment. If the Administration's FY 87 F&E request is approved, FAA will be forced to use a large portion of funds reserved for completion of some NAS Plan projects already underway, to initiate other planned NAS projects. In future years, therefore, FAA will need to seek year-by-year appropriations for all these projects. This change will inject instability into FAA's NAS planning process, creating a heretofore unencountered risk that NAS projects underway will encounter delay or cancellation in future years for lack of funding.

Continued funding shortfalls for Research, Engineering and Development and FAA Facilities and Equipment in FY 87 and beyond will have the inevitable effect of delaying completion of NAS Plan projects. In particular, ATCA fears that insufficient F&E funding in FY 87 and future years will slow or even destroy the momentim of FAA efforts to develop and deploy the Advanced Automation System (AAS). The 1986/1987 Administration Budget request fuels these fears. AAS, the largest single component of NAS modernization, involves development of a total automation system for air traffic control, including software programs to run in the new computers, and new automated controller work stations used for both en route and terminal functions ("Sector Suites"), providing automation for the first time in air traffic control towers. The sector suites will contain color displays which enhance controller discrimination between live traffic and other relevant aircraft position reference information. Auxilliary displays may portray: (1) a full radar picture with real-time weather, (2) electronic display of flight data (eliminating the need for manual paper flight stripsP, and (3) display of ATC information related to advanced functions resulting from the automated en route air traffic control (AERA) capability. The AAS will (1) permit aircraft on IFR flight plans to fly user-preferred fuel-efficient profiles, (2) increase safety of the system by reducing the potential for operational errors, (3) increase system capacity by integrating en route metering with local and national flow control, and (4) increase controller productivity by increasing the number of aircraft and volume of airspace that a control team can safely manage.

The benefits of the AAS extend beyond the area control computer complex (ACCC). Automation in the air traffic control tower will provide tower controllers with traffic and weather information not available today. Functions performed manually will be automated. Advanced metering programs and increased communication capabilities will result in maximizing terminal area capacity and reduce delays. Real-time two-way communications between field facility units (Traffic Management Unit) and Central Flow Control will enhance traffic flows (Traffic Management System); communications with the Central Weather Processor will provide real-time weather display to the controller, which is a major safety enhancement; and two-way automated communications between Flight Service Data Processor and AAS will enhance the movement of General Aviation Aircraft. AAS also enables automated transmission of critical flight data, including significant weather and ATC Notices to Airmen, directly to aircraft by Mode S data link.

The implementation of the AAS is the necessary enabling capability, that is a prerequisite, to consolidation of the over two hundred air traffic control facilities operating today into Area Control Facilities, achieving economies of scale and operations impossible in today's ATC environment.

Timely development and deployment of the AAS is absolutely crucial to maintaining the safety and efficiency of the NAS in the face of spiraling traffic demands. Although deployment of the new host computer using existing ("rehosted") software will provide limited ATC computer capacity increases necessary in the short-run, the significantly increased traffic projected into the next century can only be accommodated in a cost effective way by applying the advanced automation capacities included in the AAS program.

The FAA presently has two highly qualified AAS Design Competition Phase contractors. Both have the capability to produce and implement the AAS. In the context of the needs and benefits to be achieved through implementation of AAS, ATCA recommends that the present schedule for the Design Competition Phase be maintained.

In ATCA's view, to delay the Acquisition Phase until both contractors can fully test the design hardware and software, as suggested by GAO Interim Report IMTEC-85-11 (June 17, 1985), would indeed be detrimental to the AAS and NAS Plan implementation. More extensive testing prior to Acquisition Phase award of the AAS would be extremely costly in dollars and time. In the design competition environment, this would require both contractors to fully develop a demonstrable system, only then to discard half of the effort. ATCA strongly supports the testing of the AAS and the AERA functions included within the AAS during the Acquisition Phase, wherein capabilities to be implemented first are tested, rather than delaying the entire program for tests of functions that will be implemented much later.

In addition to concerns about loss of momentum of the AAS program, ATCA is seriously concerned that insufficient funding will delay other critical NAS improvements. For example, the Administration's FY 87 Budget contains only minimal funding for the joint FAA/DOD Long Range Radar Program, originally scheduled for contract award in FY 87. This program is for replacement of radars approaching obsolescence at joint use facilities with new upgraded equipment which would reduce maintenance work/costs. Similarly, no funding has been included for eighty Distance Measuring Equipment needed to complete the Second Generation VORTAC program.

ATCA also is concerned that FAA F&E funding shortfalls in FY 87 and future years will have the effect of delaying implementation of the critical Next Generation Weather Radar (NEXRAD) and Terminal Doppler Weather Radar (TDWR). In light of the Administration's proposal to fund 70% of the NEXRAD rather than the 30% originally planned, with Airport and Airway Trust Fund revenues, this program may now have to compete in full for the already too scarce FAA F&E dollar. With 68% of costly flight delays, and over 50% of all carrier accidents in some attributable to hazardous weather, ATCA urges Congress to assure that funding adequate to keep this program on the fast track is appropriated in FY 87.

Finally, NAS Plan Facilities and Equipment projects risk immediate delay in FY 87 as a result of insufficient ATC operations maintenance funding. Systems maintenance expenditures are composed 56% of salaries and benefits to employees, 23% leased communications, 10% rents/communication/utilities, 9% travel/transport of supplies and personnel, and 2% other expenses. Since the first 89% of maintenance funds are fixed costs, insufficient funding in the ATC maintenance area will come largely in the form of reduced travel/transportation expenditures. Since NAS Plan implementation (for example FSS consolidations) depends largely upon FAA's ability to move people and equipment, insufficient funding for ATC Operations poses a real, short-term threat to timeliness of the entire program.

CONCLUSION

Having addressed the crisis to our National Airspace System and NAS modernization posed by the Administration's FY 87 Budget Request for FAA, ATCA offers a two-pronged solution.

First, ATCA urges support of legislation pending before both Houses of Congress (S. 1979, H.R. 4191) which would separate the Aviation Trust Fund from the annual Federal Budget process. This would assure that funds raised from aviation users specifically for airport and airways improvements would be expended for stated purposes. By the end of fiscal year 1986, the Aviation Trust Fund is projected to contain a balance of nearly $3.2 billion. The money necessary for NAS modernization is already collected and available for that purpose. The Airport and Airways Improvement Act of 1982 was a major legislative initiative representing an historic agreement between the Administration, the Congress, and the users of the nation's airport/airway system that our National Airspace System would be modernized and improved. The Administration and Congress should honor the commitment made to those citizens who paid into the Fund by assuring that Trust Fund monies now available are expended for that purpose. Taking the Aviation Trust Fund out of the Federal Budget process would facilitate that end. Particularly in light of the need in 1986 for legislation authorizing continuation of the NAS modernization begun under the Airport and Airway Improvement Act of 1982, it is necessary to retain the support of NAS users by demonstrating that the taxes they paid in good faith are used for the purposes intended.

Second, while supporting the goal of national deficit reduction, ATCA nonetheless urges Congress to make increased funding for FAA, and NAS Modernization, in particular, a special priority. This will assure that the users of the NAS and the flying public receive the safe and efficient air transport system they demand and require. ATCA submits that Congress and the users of the Air Traffic Control System have expressed their desire for NAS modernization in the cooperative venture embodied in the Airport and Airway Improvement Act of 1982, and the users demonstrated their willingness to pay for those improvements through the higher user taxes which fund the Aviation Trust Fund. More and more, the public is selecting commercial air transport as its preferred means of travel. Americans are concerned about safety and efficiency in air transportation; they support Federal programs designed to improve our air transport system; and we believe they are willing to have user taxes spent for those purposes. ATCA urges Congress to make the NAS Plan a funding priority by appropriating the full amounts authorized for NAS modernization in FY 87 by the Airport and Airway Improvement Act of 1982.

Thank you for the opportunity to express these views.

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Mr. **Brown**. Thank you very much, Ms. Matthews. Mr. Nelson, do you have any questions?

Mr. **Nelson**. Do you think that the national air safety plan—can it be implemented given the funding restraints as recommended by the administration in their fiscal year 1987 budget?

Ms. **Matthews**. I think that there is not enough to do what they intended to do this year.

Mr. **Nelson**. When, under this budget—when do you think that it could be then implemented?

Ms. **Matthews**. Well. I believe that under the proposals that we have now, specifically the President's proposal, programs are going to be pushed into the future, and how far into the future is hard to tell.

Mr. **Nelson**. What about the automated system, how long would it take for the automated system to get put into effect under the present funding recommendations of the administration?

Ms. **Matthews**. I will let Mr. Varnell answer that.

Mr. **Varnell**. Related to the AAS, the FAA's position currently is that they will fully fund the program through the DCP phase which is approximately 18 to 20 months from now. Provided that there is no shortage of funds as far as the acquisition phase, there would be approximately 2 to 4 months between the DCP and the AP, or the production awards.

As the question relates to your first one of Mrs. Matthews, and that is the shortfall of the funds for this year, the shortfall of the funds for next year, and will this trend continue, if the trend does not continue, the AAS Program will not be impacted. But if the trend does continue, as Mrs. Matthews correctly points out, there will be a delay in that program. That delay could be anywhere between 1 year and 5 years depending upon the funding profile allotted for that program.

Mr. **Nelson**. Approximately how many air traffic controllers do we have right now?

Mr. **Varnell**. Approximately 14,000 to 15,000.

Mr. **Nelson**. And if I understand correctly, the Reagan administration is proposing that that be cut back in the neighborhood of about 13,000?

Mr. **Varnell**. I'm not aware of that, but I understand that the Secretary has authorized 15,000 and some number. I am not aware of the 13,000 that you speak to.

Mr. **Nelson**. Well, I remember in a conversation with Chairman Mineta that that is the figure that is holding.

In the present 1987 budget, they are holding at a figure of 15,000?

Mr. **Varnell**. Yes, that is correct.

Mr. **Nelson**. All right, what is the present date at which the automated system would be in place under the administration's scenario?

Mr. **Varnell**. It could be deployed to the field and operational within 3 to 4 years.

Mr. **Nelson**. All right, and how would the automated system affect the number of controllers that would be needed in 3 to 4 years?

Mr. VARNELL. Initially it would have no impact whatsoever, but as the AERA functions are implemented into the system, AERA I, AERA II, and AERA III, it would diminish the requirement for the controllers.

Mr. NELSON. Can you give me an example? How much? 10, 20 percent? Roughly.

Mr. VARNELL. I don't think I can give you an example of percentages at this time.

Mr. NELSON. Four years from now what do you anticipate that we need in order to be safe? Well, let me just start with this year, fiscal year 1987. Instead of 15,000 air traffic controllers, what do you think we need to be safe?

Mr. VARNELL. There is nothing wrong with the number, 15,000, of FPL controllers. The problem that exists this year is the F&E funds, not the controller funds.

Mr. NELSON. How many do you anticipate, with the expansion of air traffic in 4 years, would we need?

Mr. BANKS. First, let me clarify the recent discussions and hearings that have been held on controller staffing. I believe the present controller staffing right now is around 14,000 or a little over, and then authorized for this year, another 500 and a carry on into 1987 of 500, which brings the total up to about 15,000. That's the cap.

The concern today is how many fully professional level controllers do we have, and that number is something over 8,000 right now. Of course there is a strong training curve to make those even better. It gets into an area of real conjecture when you ask are those 15,000 going to be enough? If they are all full professional level controllers, they are probably more than enough for the next 10 years. But the whole scenario addresses a situation whereby we may at one time fail to see the forest for the trees type situation.

We are dealing in now very fixed dimensions in the navigable or the air traffic control environment. We have probably exploited every manual method there is to get more and more out of that environment. The key to more productivity and safety and you name it, is going to be in automation or future automated systems. We seem to be focusing too much on the very specifics of what these particular systems are going to be. Collectively they are automation, and collectively we can get more into that bag with automation than we can by adding more and more and more controllers.

I believe it is absolutely imperative we concentrate on where automation is going to take us into the future. I think that is the avenue that we have to pursue. How we get there is a matter of debate or how it is funded, but I would hate to see people lose sight of the fact that that is the probably the key to success down the road, and we get into the numbers on controllers and what have you, and I think probably one man's guess in this business—and we have all been in it 30 or 40 years—is good as the next man's guess.

Mr. BROWN. Would you give your name for the record, too, please?

Mr. BANKS. I'm sorry. I'm Jim Banks, James Banks with the Air Traffic Control Association.

Mr. **Nelson**. Would the technology be developed such that we could get the automated system before 3 or 4 years?

Mr. **Banks**. There is technology available that can be implemented with an automated system today if we could get the software and hardware in place. There are other parts of automation that is looked upon in the future as AERA II, III and so on, that is yet to be developed, and we get into a particular type of discussion, well if that's not there, then why even pursue it?

There are particular things that would contribute to safety today—I'll quote one, the Mode S/data link capability that is being developed. The technology is here. This morning I was reviewing a great concern for windshear, how to get the sensor information into the cockpit to the pilot to react in the 5 to 15 seconds that he might have to deal with a microburst.

It is conceivable that possibilities exist if you expand the Advanced Automation System, or some of the parts of that, Mode S/data link, that you might have a capability right now to take Doppler radar information or the low level windshear [LLWS] system-type sensors, data link that directly to the cockpit, and bypass a lot of repeat interpretation and exercise in futility, because the crew and these passengers have already spun in by the time the pilot gets the information, it is something that is absolutely essential to enable a spontaneous reaction, and automation can give us that. Nothing else can.

Those are the type of situations we are dealing with. Some are very possible and practical today, but we have got to have the machine to drive it.

Mr. **Nelson**. Thank you, Mr. Chairman.

Mr. **Brown**. Mr. Lewis.

Mr. **Lewis**. Yes, thank you, Mr. Chairman.

I guess, Ms. Matthews, or the gentlemen on your left, you are saying that you are completely comfortable with the AAS System?

Mr. **Varnell**. That's correct, Mr. Lewis.

Mr. **Lewis**. How closely have you worked with FAA on this concept?

Mr. **Varnell**. Since its inception.

Mr. **Lewis**. Will you work with the final contractor on it as far as any?

Mr. **Varnell**. Yes, I will.

Mr. **Lewis**. Do you have any reservations about the NAS plan at all?

Mr. **Varnell**. Only of the funding profile that was originally projected to support it, and the deficiency that is currently existing because of budget constraints.

Mr. **Lewis**. I'm amazed. I guess I don't have anymore questions, Mr. Chairman, at this point.

Mr. **Brown**. Mr. Howell, for an amateur, and I confess I know much less than any other member of this subcommittee about the subject, but how does this TCAS system III operate that you suggested would be a big improvement in collision avoidance systems, given both vertical and horizontal.

Mr. **Howell**. All right, sir. Each aircraft to be a vital link in the TCAS III system would be equipped with an altitude reporting transponder, and that electronic device announces the presence continually to the air traffic control surveillance system. So a second aircraft outfitted with the TCAS III system has an ear for such transmissions from a nearby transponder.

It can identify the aircraft's location with both bearing and altitude information and therefore have a three-dimensional picture, so to speak, with respect to the location of that aircraft. By tracking over a short period of time, the progress of that aircraft, a relative motion can be discerned, and if a conflict is pending, warnings can be provided to the flight crew of the outfitted aircraft.

The benefit of the TCAS III system is that it has the capability for allowing the crew to perform a horizontal resolution maneuver as well as a vertical resolution maneuver. The TCAS II system allows only the vertical resolution maneuver.

The second advantage with the TCAS III system is that because of the improved bearing accuracy, the clock position accuracy, the TCAS III system can have a lower false alarm rate, which makes it a very attractive option when you are in very dense skies as an element in an integrated system with a number of aircraft around you. We don't want to maneuver unnecessarily in crowded skies.

Mr. **Brown**. Is the system one that depends on an audio contact or a visual? Is there a display in the cockpit?

Mr. **Howell**. Yes, sir, it is contemplated at this point that there would actually be two video displays. One would be a plan view situation of the relationship of the two aircraft. Secondly, there is another instrument—our vertical speed indicator, which might be the source of commands for the maneuver which you should follow to resolve the encounter.

In the horizontal case with the TCAS III, we have not yet determined the optimum way to display the resolution command, but it appears at this point that using the plan view might be the best way to instruct the crew to maneuver in the horizontal plane.

Mr. **Brown**. Presumably, if the system is ready to go, is at a point where it can be used on commercial airliners, then most or all commercial airliners would use this system?

Mr. **Howell**. Yes, sir, if it were ready. It is not in fact ready, and that is why we are urging that that particular project, which so closely relates to safety, get full funding.

Mr. **Brown**. What about general aviation aircraft? A lot of the near collisions that we see are commercial versus, say, a small plane that is fiddling around.

Mr. **Howell**. Yes, sir, there are two things to be remembered there. First of all, there would be available a lower cost model called TCAS I which would alert the private pilot or the general aviation aircraft to the presence of another aircraft, but also, and more importantly, is the fact that even if the general aviation aircraft were outfitted with a transponder, that would be the cooperative element to allow the air carrier aircraft to electronically see him so that he could maneuver to avoid.

Mr. **Brown**. And that equipping of a general aviation aircraft with a transponder would be a relatively inexpensive requirement or what?

Mr. **Howell**. An arguable point, but certainly well worth, in my opinion, the moneys that it would cost. It would not be cheap, but it may well be worth the investment for all of us.

Mr. Brown. What kind of an estimate can we make of the cost of a major airline—commercial airline—craft when we have an accident like wind-shear accident or something of that sort. What is the economic fallout from that? Do we have any reasonable approximations of that figure?

Mr. Howell. The circumstances are so variable and the accidents, fortunately, so infrequent, it is difficult to say, but the costs are absolutely astronomical. As you know, with the current liabilities being unlimited, the liabilities to the victims or to the victims and survivors can be extraordinarily high. But beyond that is damage to the airline's reputation, to the system, to the aircraft itself, and even now we are seeing increased insurance rates being a problem.

I do not have for you a good number to say that the average accident costs so many hundreds of millions of dollars, but it would certainly be an extremely large figure.

Mr. Brown. Well, those of us who are possibly uninformed will ask simply questions like how much do we save by reducing the instance of such accidents by, say, 50 percent or so and some kind of a dollar figure is a helpful way of comparing these things, comparing them with the amount of money we think we are saving by cutting back on the budget.

Mr. Howell. I certainly do agree with you, sir. If we knew how to quantify safety gains, we could go a long way toward showing a cost-benefit ratio as we can often do with the economic side, but quantifying that safety gain is difficult.

Mr. Brown. I know, and it is not necessarily accurate on matter how you do it, but we think in simple terms around here.

Any further questions? Mr. Lewis.

Mr. Lewis. Mr. Chairman, just one quick question for Ms. Matthews. With the implementation of automated systems with all the other good stuff that we have talked about today, and we have stayed on top of FAA and have them spend the money to get this done, and we do it in an expedient manner, do you think in 5 years that a person could go to the airport and catch the 5:15 airplane and leave around 5:15 or would they still be leaving about 7 or 7:30 at night?

Ms. Matthews. I'll have to think about that one.

Mr. Lewis. Well, the air controllers get blamed for this all the time, so I just thought I would ask.

Mr. Banks. Mr. Lewis, I believe that no matter how well we make the air traffic control system and its capacity limitations, there is going to be some entrepreneur in the air transportation business that is going to find that that is good and let's add some more flights.

If you walk into Dallas/Ft. Worth today, you will find that there is 20 aircraft scheduled by American Airlines to depart at 8 o'clock in the morning. Everybody knows that they are not going to leave at 8 o'clock in the morning. One of the biggest problems we have right now in air traffic control workload is a controller now in the tower and approach control has to start sorting those aircraft out while they are still at the gate loading passengers, because there is so many scheduled for that particular time.

Now, that is fact of life, and we don't debate it, and we know that they have to keep aircraft busy flying in order to stay economically viable. It is a fact of life. It is another fact of life that you can only build a system so big to handle so many aircraft, and the way it is going now, and no matter how good we make it, there is going to be somebody that says we need just a little bit more, so it is a never-ending spiral. I think probably the agency is doing a pretty good job at trying to keep up with it, but there I go back to my original testimony that automation is going to help facilitate that to a great degree.

One of these days, we are going to wake up and find that there is 24 hours in the day, and we have only been using 8 or 10 of them, and that is probably for the future, too.

Mr. **Lewis**. What you are saying is that in 5 years, the air traffic controllers will be still be blamed?

Mr. **Banks**. Yes, I think that you can count on that.

Ms. **Matthews**. You have also got to remember that 60 percent of delays are caused by weather, and weather is always going to be a factor.

Mr. **Lewis**. I question some of that. I think that is a good excuse.

Ms. **Matthews**. And there is one more thing also. You are always limited by the amount of concrete you have on the ground. You know, we have to focus also on building our airports. You are always going to be limited by the amount of concrete and the amount of runway that you have, and that is something that we have to consider.

Mr. **Lewis**. Thank you. Thank you, Mr. Chairman.

Mr. **Brown**. I'm a, as most Congressmen are, fairly frequent airplane user, and I have come to have a degree of confidence in the delays as being the factor which will allow me to make my connecting flights, so I have quit worrying about the fact that I am going to an hour late, because the connecting flight is always an hour late, too, so I don't miss many flights that way.

Well, we appreciate very much your testimony this afternoon. I must say that all of the witnesses, I think without exception, have made a very strong case for the full funding of the plan and probably for taking it out of the budget process as a means of getting somewhere closer to full funding, and we think this is a very important point.

If we have further questions, we will submit them to you in writing. I hope you can respond, and we thank you very much for your testimony. The subcommittee will be adjourned.

[Whereupon, at 2:15 p.m., the subcommittee was adjourned subject to the call of the Chair.]

OVERSIGHT ON THE FEDERAL AVIATION ADMINISTRATION, FISCAL YEAR 1987 RESEARCH, ENGINEERING, AND DEVELOPMENT BUDGET REQUEST

WEDNESDAY, APRIL 23, 1986

House of Representatives,
Committee on Science and Technology,
Subcommittee on Transportation, Aviation and Materials,
Washington, DC.

The subcommittee met, pursuant to call, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. George E. Brown, Jr. (chairman of the subcommittee) presiding.

Mr. **Brown**. The subcommittee will come to order.

We expect a couple of the members to be in shortly, but we are going to go ahead in deference to the time.

Today the subcommittee will resume its oversight of the FAA's Research, Engineering and Development Program, as well as development and implementation of the national airspace system plan.

Yesterday, we heard from a large number of air transportation system users regarding their support for continuing these activities. Today, we want to examine more closely the progress made by the FAA, along with its plans for the future, as reflected in the fiscal year 1987 budget request. We also want to consider certain concerns about the FAA management approach, which have been raised by the GAO.

Our first witness this morning will be Dr. Carl R. Palmer, Associate Director, Information Management and Technology Division of the General Accounting Office.

We are pleased to have you here, Dr. Palmer. You may introduce your colleagues and proceed with your statement.

Dr. **Palmer**. Thank you, sir.

Mr. **Brown**. It will be included in full in the record.

STATEMENTS OF DR. CARL R. PALMER, ASSOCIATE DIRECTOR, INFORMATION MANAGEMENT AND TECHNOLOGY DIVISION, U.S. GENERAL ACCOUNTING OFFICE, ACCOMPANIED BY THEODORE ALVES, EVALUATOR; DOUGLAS CANNON, GROUP DIRECTOR; AND ALLEN LI, GROUP DIRECTOR

Dr. **Palmer**. With me today is Allen Li, the Group Director in charge of the assignment; Ted Alves, who is the Evaluator in charge of the assignment; and over by the charts that we will have up, is Douglas Cannon, who assisted.

With your permission I will summarize the views and submit a longer prepared statement for the record.

I appreciate the opportunity to comment on FAA plans to modernize its air traffic control system through the advanced automation system, commonly called the AAS, and to provide our assessment of FAA's acquisition strategy and the soundness of the $3.2 billion AAS investment to meet the future safety and efficiency needs of the nation's air transportation system.

Our testimony today is based on work requested by the House Appropriations Committee. We were asked to evaluate the technical and economic soundness of the AAS acquisition.

In June 1985, we reported our concerns about the FAA acquisition strategy for the AAS and inadequate testing of the advanced automation functions. Based on our current evaluation, we remain concerned that the technical risks involved in the AAS Program are not adequately mitigated by the FAA's acquisition strategy, and that the advanced automation features that are supposed to provide the primary benefits are not being operationally simulated before the investment commitment.

In addition, our evaluation of available benefit/cost analyses shows that the AAS investment, as currently defined, may not be economically justified.

The AAS Program, at $3.2 billion, is the largest single program in the FAA's $12 billion national airspace system plan. The AAS is expected to increase controller productivity and provide significant airspace user benefits by automating many of the functions currently performed by controllers.

We applied the following criteria to assess whether the AAS Program represents a technically and economically sound investment:

First, technical, operational, and economic risks associated with the investment should be clearly identified and minimized.

Second, the acquisition strategy should be designed to minimize these risks and to maximize system effectiveness. We would expect a major system acquisition program with significant technical operation and economic risks to require strict adherence to the phasing and extended competition principles fundamental to OMB Circular A-109.

An important facet of this guidance is that the production commitment should not be made until a systems performance is tested in a realistic operational environment. You should really fly it before you buy it.

Third, the economic and intangible benefits of the program should justify the expected investment and operating and maintenance costs.

AAS TECHNICAL AND OPERATIONAL RISKS ARE SIGNIFICANT.

FAA's current air traffic control system is one of the largest and most complex, real-time control systems in the world. In the ASS Program, virtually all air traffic control computer hardware and software will be replaced, and important new capabilities will be added with stringent performance and reliability requirements.

Operational risks are significant because many of today's routine procedures handled by controllers are eventually supposed to be performed and communicated by computer. The distribution of complex air traffic control functions across the sophisticated, multi-component architecture of new software, new hardware, and new communications systems will be both complex and difficult.

The redesign of the present software into a distributed processing system in a high-level language is complex and risky. The intricately interwoven programs and complex logic of the current air traffic control software will make redesign difficult. The AAS will use a new programming language called Ada. This language is still being developed and is relatively unproven for a large real-time system applications, such as the AAS.

FAA's strenuous availability requirements for the AAS combined with a new distributed architecture also increase technical risks. FAA requires the system to be operational or available to perform emergency mode functions 99.99999 percent of the time. This requirement means that the system outages cannot exceed 3 seconds per year. Full services must be provided 99.9995 percent of the time.

The addition of new functions, many of which have not been developed and tested or even operationally simulated, also increases the difficulty of the system development. The advanced automation functions of AERA are supposed to be the sources of significant labor-saving features for FAA controllers, and the principal source of most airspace user benefits.

Significant questions about the automated functions of AERA remain unanswered. In August 1985, an FAA committee raised 87 questions about the AERA functions. The AERA committee classified some of these questions as critical to the development of both AERA 1 and AERA 2

FAA, however, does not have an approved plan to perform operational simulation of AERA functions before the production decision.

Many of the other systems the AAS will interface with, or depend on, are also still being developed. And thus, they represent risks to the planned evolution of the AAS, if problems are experienced in these related programs.

Achieving the requirements for overall system performance, system capacity, and high availability, make the AAS development and production a challenging task like only a few in or out of Government. It is as complex as they come. FAA's failure to adequately identify risks increases the likelihood that it will experience negative effects.

FAA'S CURRENT ACQUISITION STRATEGY DOES NOT ADEQUATELY MITIGATE RISK

FAA's two-phased acquisition strategy differs from that recommended for the acquisition of major systems like the AAS. Rather than using a four-phase process, with successive approvals based on demonstrated results and extended competition to minimize risk, as recommended by OMB Circular A-109, FAA incorporates only one decision point before committing to a combined, concurrent development test and production phase.

In addition, FAA's strategy incorporates full production of the most costly element, the controller workstation, concurrent with the development of the most complex software and hardware elements. FAA contends that its acquisition strategy is sound.

However, we believe that the strategy does not provide a sufficient basis to make a sound production decision. The FAA's design competition phase will culminate in an on-paper system design from both contractors, prototypes of the controller workstation console, computer model simulations of system performance, and design tradeoff analyses. We believe these are important tools to select among design alternatives. However, we believe they are inadequate to ensure that the proposed system, when fully developed and produced, will meet its critical performance and availability requirements.

Because the performance models rely on simplifying assumptions about complex and not well-understood system interactions, simulations should be validated through testing of actual hardware and software to reliably predict system performance. In the current FAA acquisition strategy, no AAS testing will be performed, and no software will be developed before the production commitment is made. Therefore, neither FAA nor the contractors will be able to validate the contractor's models through these means.

The danger of relying on paper designs, even supported by extensive computer simulations is illustrated by Navy's recent experience with its SUBACS Program. The local communication network's performance capability were modeled based on assumptions about the system. Subsequent tests however, showed that actual performance was only one-sixth as fast as the model predicted and the system required. This problem had a major cost schedule and performance impact on the Navy's plans to improve its submarine's command and control systems.

We also believe that FAA's planned demonstration of the controller workstation will not insure that it will either perform as required or be operationally suitable. The primary demonstration is a contractor-conducted display simulation of a prototype workstation console without its computers, communications equipment, or software. Hardware and software reliability will not be demonstrated even though critical to FAA's requirements.

FAA also states that an additional contractor to perform development and testing before making the production decision as recommended by Circular A-109, is not justified. According to FAA, additional testing would add 40 months to its schedule, cost an additional $300 million and cause the loss of $3.8 billion in FAA and user benefits.

We disagree with these estimates. As an alternative on the basis of FAA's current plans, we believe that critical en route AAS functions could be developed and tested within 24 to 27 months after the conclusion of the design phase. FAA testified last year that implementing a full-scale development and test phase would result in about a 2-year delay. No changes in FAA's test program occurred between these two estimates.

In addition, unless the second contractor represents a truly viable competitor and its design is a good alternative, the extra cost of continuing the competition would not be a good choice. Our evaluation of the economic soundness of the AAS shows that FAA's claim of $3.8 billion in lost benefits is overstated.

AAS BENEFITS MAY NOT EXCEED COST

We evaluated the benefit cost information provided in FAA's 1982 response to the Congress, and the 1985 unapproved draft MITRE benefit cost study of the Advanced Automation Program, that includes both the Host system and the AAS.

I would like to direct your attention to the chart which depicts the two economic analyses we reviewed, and the adjustments we made to the MITRE study figures. [Chart presentation.]

Columns 1 and 2 compare the benefits and costs estimated in the FAA and MITRE studies discounted to the same base year of 1982. In its 1982 response to the Congress, FAA justified the Host, AAS, and AERA and Mode-S Programs estimating that benefits would be about four times greater than costs. The 1985 MITRE study estimated the quantifiable benefits from these same programs would be about twice as large as costs, even though new categories of benefits were found and added for the AAS.

Columns 3 through 7 show the effect of adjustments we applied to the 1985 MITRE study figures.

Column 3 shows reduced benefits of $1.4 billion and reduced costs of $340 million to eliminate the benefit and cost estimates properly attributable to the Host Computer Program and related enhancements. We deducted these benefits and costs because they are incurred and achieved independently of the AAS Program.

Column 4 reduces the benefits another $784 million to reflect the actual phasing in of the AERA Program benefits, as indicated by the supporting analysis cited in the MITRE study.

Column 5 shows another $288 million benefit reduction and a $102 million cost increase due to AAS and AERA Program slippage and AAS cost growth.

Column 6 reduces the benefits by $113 million based on a revised OMB long-term oil price forecast published last year. However, the magnitude of the recent decline in the price of oil is not fully reflected in this adjusted or revised forecast. If this recent decline is sustained over a long period of time, benefits would be reduced much more.

At this point approximately $1.1 billion of the remaining $3.1 billion in benefits is attributable to passenger time savings.

To obtain the large total savings, MITRE assumed that no flights were granted, user-preferred—fuel-efficient—routes until AERA 1 was implemented with the AAS. At that time, MITRE assumed that all flights would be granted direct routes, and that these routes would yield a time savings of 3 minutes or less on most flights and approximately 6 minutes on a 5 hour, cross-country flight. MITRE essentially added up all the few minutes saved by millions of passengers over 17 years, and multiplied that by $20.50 per hour, the assumed hourly earnings of an airline passenger.

We believe that some of the assumptions and the methodology used to develop this estimate are questionable, particularly the assumption that no flights will be granted user preferred routes until AAS AERA 1 is implemented. We found that many flights are

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flying user preferred routes under the current system. Further, the amount of time passengers save might be considered immaterial by an individual passenger—who would be saving at most only a few minutes of flight time. OMB supports this view that passenger time savings of less than 5 or 10 minutes are immaterial and should not be used to justify FAA programs like the AAS.

Column 7 shows the impact of eliminating the passenger time savings benefits. As indicated the quantifiable AAS benefits no longer exceed costs. The remaining $2 billion in benefits may fall further due to the lower price of fuel and several questionable assumptions. Further, significant uncertainty also exists about AAS cost growth. The program has already encountered significant cost growth, at least 50 percent in the design competition phase. And as we pointed out earlier, FAA's acquisition strategy increases the risk of further cost growth.

SUMMARY

In summary, under the best of circumstances the technical and operational risks associated with developing the AAS are high. The software and other key AAS components are extremely complex, and some of the technology required is pushing the state of the art. The dramatic change in the way air traffic will be controlled serves to increase these risks. The economic risks of a $3.2 billion investment will make any major development problems encountered economically significant.

FAA's two-phased acquisition strategy differs from that recommended for the acquisition of major systems like the AAS. Rather than minimizing risk by using a four-phased process, demonstrated results and extended competition, FAA has only one decision point before committing to a combined development test and production phase. This combined phase incorporates full production of the most costly element, the controller workstation, concurrent with the development of the most complex software and hardware elements. With the technical risks and the economic stakes involved we believe this represents an unacceptably high risk to the government.

Based upon our analysis, the resulting low benefits-to-cost ratio clearly does not justify an accelerated acquisition strategy. We are not arguing against introducing a new workstation before the full AAS is implemented, only against rushing into full production of the workstation before the rest of the system has been developed, tested, and its design and performance are proven.

We continue to believe that follow-on air traffic control automation is needed. However, the Host computer systems should provide the time needed to properly develop the AAS. We believe that incorporating a development and test phase before the AAS production decision would make a more prudent acquisition strategy.

In other testimony last week we reported on continuing problems FAA has had in acquiring the technologies required for the national airspace system plan. Our work identified a number of other examples where FAA did not, or does not plan to adequately demonstrate system performance, in a realistic operational environment, before committing to full-scale production, and the costly consequences of this strategy.

We have cited specific examples such as the automated flight service station, automated weather observing system, the microwave landing system, and terminal Doppler weather radar. We believe that continuing with the current AAS acquisition strategy, and without operational simulation of AERA—advanced automation—functions, could result in significant performance and reliability in adequacies, cost increases, and unrealized benefits.

The bottom line is that we have the time to do it right; but I don't think we have the time and money to do it over.

PROPOSED COURSE OF ACTION

We plan to do additional work on the AAS Program and related systems. However, based on our work to date, we believe changes are needed in FAA's program in order to minimize the risk of the AAS acquisition, and to insure that the AAS effectively meets the future safety and efficiency needs of the Nation's air transportation system. Therefore, we believe that Congress should consider directing FAA to do three things:

One, FAA should revise its current acquisition strategy to incorporate a contract phase to develop and operationally test prototype models of critical components under realistic conditions before the decision and contract are made for full production quantities. At a minimum, critical components should include the controller workstation, en route AAS hardware and software, and the local communications network.

Two, we think the FAA should reexamine the AAS features and requirements to identify the most inexpensive and cost-effective alternatives and to revalidate its requirements before proceeding to the development and testing phase.

And three, we think FAA should verify the benefit estimates and the operational suitability of AERA 1 and 2 functional enhancements by operational simulation, as soon practicable, and before proceeding with full-scale production.

This concludes my testimony, Mr. Chairman, I will be pleased to answer any questions that you or others may have at this time.

[The prepared statement of Dr. Palmer follows:]

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

FOR RELEASE ON DELIVERY
EXPECTED AT 9:30 A.M.
WEDNESDAY, APRIL 23, 1986

STATEMENT OF
CARL R. PALMER, ASSOCIATE DIRECTOR
INFORMATION MANAGEMENT AND
TECHNOLOGY DIVISION
BEFORE THE
SUBCOMMITTEE ON TRANSPORTATION,
AVIATION AND MATERIALS
OF THE
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
ON
FAA'S ADVANCED AUTOMATION SYSTEM

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Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to comment on FAA's plans to modernize its air traffic control system through the Advanced Automation System--commonly called AAS--and to provide our latest assessment of FAA's acquisition strategy and the soundness of the $3.2 billion AAS investment to meet the future safety and efficiency needs of the nation's air transportation system.

Our testimony today is based on work requested by the House Appropriations Committee. We were asked to evaluate the technical and economical soundness of the AAS investment. Based on our current evaluation, we remain concerned that (1) the technical risks involved in the AAS program are not adequately mitigated by the acquisition strategy and (2) that the advanced automation features, that are supposed to provide the primary benefits, are not being operationally simulated before the investment commitment. In addition, our evaluation of available benefit/cost analyses shows that the AAS investment, as currently defined, may not be economically justified.

In our earlier report, we expressed our concerns about the AAS acquisition strategy and the incomplete testing of advanced automation functions.[1] In another report, we questioned FAA's

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[1] GAO Questions Key Aspects of FAA's Plans To Acquire the Multi-Billion Dollar Advanced Automation System and Related Programs (GAO/IMTEC-85-11, June 17, 1985).

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plans to make a production decision on the Host computer system without full performance testing.[2] We will report on our latest evaluation of the Host program in June 1986. Today's testimony addresses only the AAS program. (The appendix provides a more detailed explanation of the objectives and scope of our review.)

THE AIR TRAFFIC CONTROL SYSTEM

Computers support FAA's air traffic control mission--a service provided to promote the safe, orderly, and expeditious flow of air traffic by maintaining the necessary separation between aircraft.

Air Route Traffic Control Centers control air traffic that is en route or between airports and operating under instrument flight rules. These centers ensure aircraft separation and provide traffic advisories and weather information to pilots. A typical center is responsible for more than 100,000 square miles of airspace and scores of air routes, which are like electronic highways to pilots. The center's airspace is divided into geographical areas called sectors, which define the area for which the controllers are responsible. There are 20 en route centers in the continental United States and 4 offshore centers. Terminal Radar Approach Control facilities sequence and separate aircraft arriving at or departing from airports, while Air Traffic Control

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[2] Federal Aviation Administration's Host Computer: More Realistic Performance Tests Needed Before Production Begins (GAO/IMTEC-85-10, June 6, 1985).

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Towers handle traffic that is in the immediate vicinity of major airports. There are approximately 188 Terminal Radar Approach Control facilities and 400 Air Traffic Control Towers at major airports across the country.

Today, to provide essential aircraft position and flight plan information to controllers, IBM 9020 computers, deployed between 1969 and 1977, operate at FAA's en route centers. These computers take inputs from many radars, identify and track the targets, associate the tracks with flight plans, and display the aircraft identification and position location. The computers also take flight plan data, perform necessary updates, and print flight progress strips. Changes to flight plans require coordination and pencil marking by controllers. The 9020 computers also use the radar and flight plan data to provide two safety-related warnings--Conflict Alert, when two aircraft are predicted to have less than standard separation within the next 2 minutes, and Minimum Safe Altitude Warning, when an aircraft is predicted to be below a predetermined safe altitude within the next several minutes.

AIR TRAFFIC CONTROL COMPUTER MODERNIZATION PLANS

Before presenting the results of our evaluation, I will briefly describe what the AAS program is expected to accomplish and its present status. The AAS--at $3.2 billion--is the largest single program in FAA's $12 billion National Airspace System Plan, which is intended to modernize and improve air traffic control and airway facilities services. The plan assumes that, unless aging and technically obsolete facilities are modernized, FAA will be unable to keep pace with the nation's air traffic demands. The goal of the plan is to increase safety, capacity, productivity, and economy by implementing more automation and by consolidating facilities. To gain near-term capacity increases and to provide the time needed to develop the AAS, FAA is installing the new Host computer system at centers that control aircraft en route between airports. The Host computer will allow processing of existing air traffic control software on new equipment. In the short-term, terminal operations around major airports are scheduled for minor equipment upgrades. The AAS is FAA's longer term program and is expected to (1) enable the consolidation and replacement of en route and terminal facilities, (2) increase controller productivity and system availability, (3) reduce operating costs, (4) save fuel and (5) automate many of the functions currently performed by controllers, thus dramatically changing the way air traffic is controlled.

The AAS and advanced automation functions are scheduled for deployment in several steps, each of which is expected to provide increased capability.

1991-1993. Controller workstations with new displays, workstation software, and a local communications network will be deployed at en

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route centers to operate using existing air traffic control software and the Host computers. FAA refers to this step as the Initial Sector Suite System or ISSS.

1993-1994. The full en route AAS will replace the existing en route air traffic control software and most data processing hardware, and add the first set of advanced automation functions--called Aera 1. Aera 1 functions will predict the future location of aircraft and check for potential conflicts.

1994-1998. All of the 188 terminal radar control facilities will be consolidated into 23 centers, which will be called Area Control Facilities, and the tower automation portion of the AAS will be deployed at selected airport towers.

1997-1999. The second set of automation functions, called Aera 2, will be added for en route control. Aera 2 functions will provide controllers several alternative resolutions to potential conflicts identified by the AAS and will improve coordination with other controllers.

2000 and beyond. The third set of automated functions, Aera 3, is not yet fully defined. It is hoped, however, that with these functions, the computer will be able to select the proper resolution of potential conflicts and communicate course and altitude changes directly to the aircraft.

The AAS acquisition is being conducted in two phases. Phase 1 is a design competition between the IBM Corporation and Hughes Aircraft Company. Awarded in August 1984, both contracts amounted to approximately $247 million and require on-paper system designs by mid-1987. The design competition phase has recently incurred a 6 month delay and a cost increase of over $120 million. This happened because not all Aera 1 requirements were included in the contracts; new requirements, such as color displays, were added; and FAA and the contractors had to clarify other requirements.

In March 1987, FAA plans to issue a Request for Proposals for phase 2--a concurrent development and production contract that will be awarded to one of the contractors in early 1988. The Congress will be asked to make the $3.2 billion investment commitment to this system in the spring of 1987 when FAA requests appropriations for fiscal year 1988.

EVALUATION CRITERIA

We applied the following criteria to assess whether the AAS program represents a technically and economically sound investment.

First, technical, operational, and economic risks associated with the AAS program should be clearly identified and minimized. We would expect FAA to have completed a detailed and systematic

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analysis of such risks, identifying potential problems, the potential effect of these problems, and steps taken to reduce these risks or their effect. Risks exist when (1) significant hardware or software changes are made, (2) new or untried technologies or development methods are used, or (3) new functions or applications are performed. Risks associated with other interdependent systems or programs also need to be considered.

Second, the acquisition strategy should be designed to minimize these risks and to maximize system effectiveness. We would expect a major system acquisition program with significant technical, operational, and economic risks to require strict adherence to the phasing and extended competition principles fundamental to Office of Management and Budget Circular A-109. This circular recommends four separate acquisition phases: (1) concept exploration, (2) concept demonstration, (3) full-scale development and testing, and (4) production. An important facet of this guidance is that the production commitment should not be made until a system's performance is tested in a realistic operational environment. The importance of following this approach was recently affirmed in the February 1986 Interim Report of the President's Blue Ribbon Commission on Defense Management. This report concluded that full-scale development testing of weapons systems is critical to improve system performance and that systems should not go into high-rate production without operational test results. The report also stated that we should "fly and know how much it will cost before we buy."

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Third, the economic and intangible benefits of the program should justify the expected investment and operating and maintenance costs.

AAS TECHNICAL AND OPERATIONAL RISKS ARE SIGNIFICANT

FAA's current air traffic control system is one of the largest and most complex real-time control systems in the world. Replacing this system would be an extremely complex and risky undertaking even without the addition of new capabilities and new technologies. In the AAS program, virtually all air traffic control computer hardware and software will be replaced, and important new capabilities with stringent performance and reliability requirements will be added. Operational risks are significant because many of today's routine procedures handled by controllers are eventually supposed to be performed and communicated by computer. Complexity and risks are caused by the cumulative effect of redesigning the software; using a new computer language; designing a system with very high availability requirements; replacing the hardware, including controller workstations; incorporating new automated functions; and interfacing with other systems still in development.

The redesign of the present software into a distributed processing system in a high level language is complex and risky. The intricately woven programs and complex logic of the current air

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traffic control software will make redesign difficult. The current software has been referred to as an "intertwined mess" due to numerous coding changes made over 15 years. The addition of new functions, many of which have not been developed and tested or even operationally simulated, increases this difficulty.

According to the AAS Program Manager, the AAS will use a new programming language called Ada. This language, sponsored by the Department of Defense, is still being developed and is relatively unproven for large real-time system applications such as the AAS. FAA's strenuous AAS availability requirements, combined with a new distributed architecture, also increase technical risks. FAA requires the system to be operational or available to perform emergency mode functions 99.99999 percent of the time. This requirement means that system outages cannot exceed 3 seconds per year. Full services must be provided 99.9995 percent of the time. At this level, the system cannot be out for more than about 2.6 minutes per year.

The distribution of complex functions across a sophisticated, multi-component architecture of new software, hardware, and communications systems also increases the development risks. Further, the high resolution, flat color video display of the controller workstation, and the capacity requirements of the local communications network are pushing the state of the art and represent development, producibility, and reliability risks.

Anticipating the extension of the system to perform full automation functions that have not yet been fully defined further adds to the complexity and risks. The advanced automation functions of Aera are the source of significant labor-saving features for FAA controllers and the principal source of most airspace user benefits. Significant questions about the automated functions of Aera remain unanswered. For example, in July 1985 an FAA committee, charged with overseeing Aera development, raised 87 questions about the Aera functions. The Aera committee classified some of these questions as critical to the development of both Aera 1 and Aera 2 and indicated that some could be answered by testing and simulation and should be resolved before the AAS production decision. FAA, however, does not have an approved plan to perform operational simulation of Aera functions before the production decision.

Many of the other systems the AAS will interface with or depend on are also still being developed and thus represent risks to the planned evolution of the AAS. Problems have been experienced in related programs. Performance testing of the Host computer, which must be operational at all centers before the controller workstations are installed, has been delayed due to software conversion difficulties. Because of program difficulties, the Mode S surveillance system, which will provide more accurate position information and enable direct aircraft to computer linkages, will be tested concurrently with operational installation to meet deployment milestones. Also, any slippage in the development of the critical Voice Switching and Control System,

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which permits automated controller voice communications, would delay workstation deployment.

Achieving the requirements for overall system performance, system capacity, and high availability makes the AAS development and production a very challenging task like only a few in or out of the government--it is as complex as they come. Failure to adequately identify and mitigate risks increases the likelihood of unsatisfactory performance, including poor system reliability; cost increases; and schedule delays in the development and production phase.

FAA's CURRENT ACQUISITION STRATEGY DOES NOT ADEQUATELY MITIGATE RISKS

FAA's two-phase acquisition strategy differs from that recommended for the acquisition of major systems like the AAS. Rather than using a four-phase process with successive approvals based on demonstrated results and extended competition to minimize risks, as recommended by Office of Management and Budget Circular A-109, FAA incorporates only one decision point before committing to a combined development, test, and production phase. In addition, FAA's strategy incorporates full production of the most costly element--the controller workstation--concurrent with the development of the most complex software and hardware elements.

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FAA contends that its acquisition strategy is sound. However, we disagree that the acquisition strategy provides a sufficient basis to make a sound production decision.

FAA's design competition phase will culminate in:

--A complete on-paper system design from both contractors for the Initial Sector Suite System and the full en route and tower AAS systems, including the Aera 1 advanced automation features. Contractors will also show how their designs can be extended to perform Aera 2 and Aera 3 functions.

--A prototype of the controller workstation console, a simulated display of typical air traffic control situations, and a demonstration of how effectively and safely controllers interact with the prototype console.

--Computer model simulations of top-level design issues and the principal functions and operations of the system, with overall system performance model analyses and trade-off analyses.

--Life cycle cost estimates.

We believe system design documentation, trade-off analyses, and computer model simulations are important to select among design alternatives. However, we believe they are inadequate to ensure

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that a proposed system, when developed and tested, will meet its critical performance and availability requirements.

Because performance models rely on simplifying assumptions about complex and not well understood system interactions, simulations must be validated through testing of actual hardware and software to reliably predict system performance. In the current FAA acquisition strategy, no AAS testing (other than a limited demonstration of the controller workstation console) will be performed and no software will be developed before the production commitment is made. Therefore, neither FAA nor the contractors will validate the contractors' models to ensure that proposed systems will perform as required. An official of the Federal Computer Performance and Simulation Center told us that it is dangerous to rely on unvalidated models to ensure that system performance requirements will be met.

The danger of relying on paper designs, even supported by extensive computer simulations, is illustrated by the Navy's recent experience with its SUBACS program.[3] This program is similar to the AAS in that it uses a distributive architecture to distribute and communicate data. The local communications network's performance capabilities were modeled based on assumptions about the complexity of the network's operating system and the time required for processing. Subsequent communications network tests, however, showed that actual performance was only one-sixth as fast as the model predicted and the system required. The designers had underestimated the complexity of the network's operating system and had assumed the computer program would require far fewer lines of code than were actually needed. This problem had a major cost, schedule, and performance impact on the Navy's plans to improve its submarines' command and control systems. The system has been redesigned at substantial cost. The SUBACS contractor program director told us that performance models should be validated with actual performance tests to use them successfully in an acquisition.

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[3] SUBACS Problems May Adversely Affect Navy Attack Submarine Programs (GAO/NSIAD-86-12, Nov. 4 1985).

We also believe that FAA's planned demonstration of the controller workstation will not ensure that it will either perform as required or be operationally suitable. The primary demonstration is a contractor-conducted display simulation of a prototype workstation console without its computers, communications equipment, or software. The demonstration will show how the input and output devices will perform, and the screens will show simulated displays of typical air traffic control situations. Accessibility for maintenance purposes will also be demonstrated. However, problem recognition and diagnosis will not be demonstrated. Hardware and software reliability will also not be demonstrated, even though high reliability is critical to meeting FAA's stringent availability requirements. Thus, FAA will not have operationally tested this workstation in a realistic environment before making a production decision; instead it will rely on the

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design documentation, computer performance model simulations, and the results of a limited demonstration of one subsystem to ensure that requirements will be met.

As a result of our concerns about FAA's reliance on computer performance simulations and the limited demonstration of the prototype workstation, we continue to believe that FAA has not adequately identified and mitigated AAS development risks. This increases the need for an acquisition strategy that minimizes risks. We believe that FAA's strategy of delaying developmental testing until after production commitment is made increases rather than decreases the economic risks.

FAA contends that an independent organization, the FAA Operational Test and Evaluation staff, will assess the operational readiness of the AAS before the production decision, thus reducing the risk the AAS will not meet operational requirements. An official from this organization, however, told us his group will not have enough information to fully evaluate the program since no operational readiness testing will be completed until 18 months after the production contract award. The staff plans to recommend that the production contract be awarded on the condition that they continue their oversight until test results are available. This information is not reflected in FAA's January 1986 response.

FAA also states that additional testing before making the production decision, as recommended by Circular A-109, is not justified. According to FAA, additional testing would add 40 months to their schedule, cost an additional $300 million, and cause the loss of $3.8 billion in FAA and user benefits. We disagree that it would take 40 months to obtain sufficient system performance information and that lost benefits would be as large as FAA claims.

FAA's current development and testing plans call for critical AAS hardware and software elements to be subjected to extensive performance and operational tests about 2 years after the production contract award. Thus, delaying the production contract award until these tests are completed would add about 2 years to the schedule. However, the added time would provide important additional information about AAS system performance and effectiveness. By that time, tests would have shown whether

--controller workstation functional and performance requirements can be met at the maximum expected workload when operating with the Host computer system;

--some portion of the en route AAS input, output, and display processing requirements can be met; and

--some AAS tower requirements can be met.

FAA should have considered these or other intermediate milestones as possible alternatives to its current acquisition

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strategy. The agency should also have considered revising the AAS program to achieve earlier development and testing of the most critical AAS elements.

We did not attempt to prepare an optimized development and test schedule. However, on the basis of FAA's current plans, it appears that critical en route AAS functions could be developed and tested within 24 to 27 months after the conclusion of the design phase. The extra cost of continuing a second contractor for this period of time would be roughly $200 million, or about seven percent of AAS investment costs. We also noted that FAA had testified last year that implementing a full-scale development program would result in about a 2 year delay. No changes in FAA's test program occurred between the 2 year and 40 month estimates. In addition, unless the second contractor represents a truly viable competitor and its design is a good alternative, the extra cost of continuing a competition may not be a good choice. In this case, FAA could develop and test one system at little or no added cost before awarding a production contract.

I will now discuss our evaluation of the economic soundness of the AAS and show that FAA's claim of $3.8 billion in lost benefits caused by earlier testing is overstated.

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AAS BENEFITS MAY NOT EXCEED COSTS

FAA has not completed a separate officially approved benefit/cost analysis or independent cost estimate for the AAS. Currently it is performing such an analysis at the direction of House Joint Resolution 465 on Further Continuing Appropriations for Fiscal Year 1986, and plans to complete it by early 1987. Consequently, we reviewed the most current benefit/cost information available. We evaluated the benefit/cost information provided in FAA's 1982 Response to the Congress[4] and the 1985 unapproved draft MITRE benefit/cost study[5] of the advanced automation program that includes both the Host system and the AAS.[6] Our evaluation indicates quantifiable AAS benefits may not exceed AAS costs.

While our analysis of the draft MITRE study indicates that the quantifiable benefits may be less than AAS costs, we recognize that other unquantified and non-quantifiable benefits, such as increasing safety, eliminating old equipment, and providing better controller working conditions, should also be considered. The

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[4] Response to Congressional Recommendations Regarding the FAA's En Route Air Traffic Control Computer System (DOT/FAA/AAP-82-3, Jan. 1982).

[5] Benefit/Cost Study For The Advanced Automated Air Traffic Control System (DOT/FAA/AAP-84-32, Draft April 1985).

[6] We did not evaluate a third estimate by Martin Marietta because Martin Marietta officials told us the estimate was based on one expert's opinion and needed to be validated by an extensive analysis.

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total benefits of Aera's advanced automation features appear to outweigh significantly the modest costs of developing these features.

I would like to direct your attention to the chart, which depicts the two economic analyses we reviewed and the adjustments we made to the MITRE study figures. Columns 1 and 2 compare the benefits and costs estimated in the FAA and MITRE studies, discounted to the same base year of 1982. In its 1982 response to the Congress, FAA justified the Host, AAS, Aera, and Mode S programs, estimating that benefits would be about four times as great as costs. The 1985 MITRE study estimated that quantifiable benefits from these same programs would be about two times as large as costs.

To gain a perspective on currently estimated benefits, let me explain their composition. In the MITRE study, external user benefits, many of which were not quantified in the 1982 response to the Congress, were estimated to constitute about 85% of the total benefits and come from (1) reduced aircraft fuel consumption ($1.2 billion), (2) reduced airline operating costs ($1.4 billion), and (3) airline passenger time savings ($2.2 billion). Internal FAA benefits, primarily from increased controller productivity ($1 billion), account for the remaining 15 percent of the total.

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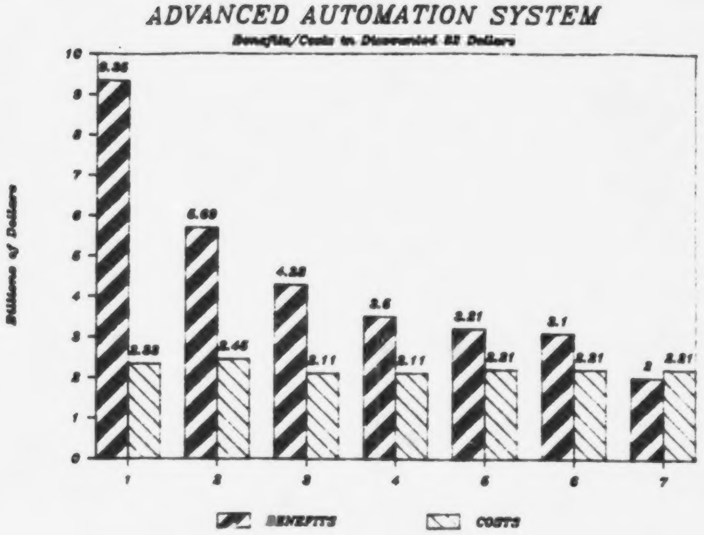

LEGEND

(1) Benefits and costs per FAA's 1982 Response to Congressional Recommendations.

(2) Benefits and costs per unapproved 1985 MITRE benefit cost study of the Advanced Automation Program. Figures are discounted to 1982 dollars.

(3) Benefits adjusted by GAO to reflect reduction due to savings attributed to Host computer system and En Route Metering II (not attributable to AAS). Costs adjusted by GAO to reflect reduction due to Host computer system costs.

(4) Benefits adjusted by GAO to reflect conformance to supporting study methodology referenced in 1985 MITRE study.

(5) Benefits adjusted by GAO to reflect AAS program implementation change.

(6) Benefits adjusted by GAO to reflect revised OMB fuel price forecast.

(7) Benefits adjusted by GAO to reflect elimination of passenger time savings.

Columns 3 through 7 show the effect of adjustments we applied to the 1985 MITRE study figures. Column 3 shows reduced benefits of $1.4 billion and reduced costs of $340 million to eliminate benefits and costs properly attributable to the Host computer program and related enhancements. We deducted these benefits and costs because they are incurred and achieved independently of the AAS program. Column 4 reduces benefits another $784 million to reflect the actual phasing in of the Aera program benefits, as indicated by the supporting analysis cited in the MITRE study. Column 5 shows another $288 million benefit reduction and a $102 million cost increase due to AAS program slippage and cost growth from increased requirements. Column 6 reduces the benefits by $113 million due to Office of Management and Budget revised long-term oil price forecasts. However, the magnitude of the recent decline in the price of oil is not fully reflected even in the revised forecast. If this recent decline is sustained over a long period of time, benefits would be reduced much more.

At this point, approximately $1.1 billion of the remaining $3.1 billion in benefits is attributable to passenger time savings. To obtain the large total savings, MITRE assumed that no flights would be user-preferred, fuel-efficient routes until Aera 1 was implemented with the AAS. At that time, all flights could be granted user-preferred routes and these routes would yield a time savings of 3 minutes or less on most flights and approximately 6 minutes on a 5 hour cross-country flight. MITRE essentially added up all the few minutes saved by millions of passengers over 17

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years and then multiplied that by $20.50 per hour--the assumed average hourly earnings of an airline passenger.

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We believe some of the assumptions and the methodology used to develop this estimate are questionable, particularly the assumption that no flights can be granted user-preferred routes until AAS/Aera 1 is implemented. As we will explain shortly, many flights are flying user-preferred routes under the current system. In addition, the amount of time passengers save might be immaterial to an individual passenger who would be saving at most only a few minutes of flight time. The Office of Management and Budget supports the view that such small increments of passenger time savings, less than 15 minutes, are immaterial and should not be used to justify FAA programs such as the AAS. Column 7 shows the impact of eliminating the passenger time savings benefits. As indicated, the remaining $2 billion of quantifiable AAS benefits no longer exceed costs.

The remaining $2 billion in benefits may fall farther due to the lower price of fuel and several questionable assumptions. For example, the MITRE study assumed that no user-preferred direct routes would be granted until Aera 1 was implemented, and then it assumed that all requests would be granted. User-preferred direct routes not only affect passenger time, as noted earlier, but also operating costs and fuel savings. Although FAA does not keep records of direct routes granted, we found that a significant number is now granted and that FAA is working to increase that number. Further, we found that most preferred altitude requests are granted now. Also, uncertainties about Aera and controller workstation productivity estimates could further reduce benefits.

FAA's air traffic growth forecasts have also historically overstated actual traffic growth. The MITRE study projected continuing high growth rates beyond FAA's forecast period. This could further inflate future air traffic estimates. Air traffic growth affects all categories of benefits, and to the extent air traffic growth is lower than predicted, benefits would also be lower. Finally, significant uncertainty also exists about the AAS cost growth; the program has already encountered significant cost growth (at least 50% in the design competition phase), and, as we pointed out earlier, FAA's acquisition strategy increases the risk of further cost growth.

SUMMARY

Under the best of circumstances, the technical and operational risks associated with developing the AAS are high. The software and other key AAS components are extremely complex and some of the technology required is pushing the state of the art. Combined with these are the technical and operational challenges associated with the dramatic change in the way air traffic will be controlled, which serve to increase these risks. Interdependency of systems critical to the AAS (Host computer, Mode S, and Voice Switching and Control System) increase AAS risks. The economic risk of a $3.2 billion investment in AAS will make any major development problems encountered economically significant.

FAA's two-phase acquisition strategy differs from that recommended for the acquisition of major systems like the AAS. Rather than minimizing risks using a four-phase process with successive approvals based on demonstrated results and extended competition, FAA incorporates only one decision point before committing to a combined development, test, and production phase. This combined phase incorporates full production of the most costly element, the controller workstation, concurrent with the development of the most complex software and hardware elements. FAA will have only system designs, limited workstation console demonstrations, and unvalidated performance simulations on which to base its production decision, because actual development will not have taken place and performance tests are thus not possible. With

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the technical risks and the economic stakes involved, we believe this represents an unacceptably high risk to the government.

Further, FAA's current benefit estimates for the AAS are questionable and an independent cost estimate has not been prepared. Based on our analysis, the resulting low benefit to cost ratio clearly does not justify an accelerated acquisition strategy--that is, one that requires production of the controller workstations concurrent with the development and testing of all other complex components in order to install them early. We are not arguing against introducing the new workstation before the full AAS is implemented, only against rushing into full production of the workstation before the rest of the system has been developed, tested, and its performance proven.

We continue to believe that follow-on air traffic control automation is needed to address system needs, potential improvements, and deficiencies not corrected by the near-term Host computer system program. However, the capacity and capabilities provided by the Host computer systems should provide the time needed to properly develop the AAS. We believe that incorporating a development and testing phase before the AAS production decision would be a more prudent acquisition strategy.

Introducing another phase into the acquisition strategy, thus permitting operational performance testing of critical elements (including the controller workstation and en route AAS hardware,

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software, and communications technology) would improve both the basis for the production decision and the final design for full-scale production. Reduced concurrency of production of the controller workstations with the development of software and other complex components would serve to minimize both technical and economic risks. We believe that a development and operational testing phase, without concurrent production, needs to be incorporated into the FAA's acquisition strategy to reduce risks. We estimate that FAA's current development and test schedule would provide significant system performance information to make a more prudent production decision about 2 years later than their currently scheduled decision point. Thus, it would not require the 40 months time claimed by FAA. In addition, optimizing the schedule to develop and test critical elements early could provide even more information in that timeframe. We believe that continuing with the current strategy, especially without the operational testing of Aera functions, could result in significant performance and reliability inadequacies, cost increases, and unrealized benefits.

House Joint Resolution 465 on Further Continuing Appropriations for Fiscal Year 1986 directed FAA to complete a realistic benefit/cost analysis. This analysis, supplemented by operational simulation and testing of the new Aera functions, should be very valuable to the Congress prior to making its major funding commitment.

PROPOSED COURSE OF ACTION

We plan to do additional work on the AAS program and related systems. However, based on our work to date, we believe changes are needed in FAA's program in order to minimize the risks of the AAS acquisition and to ensure that the AAS effectively meets the future safety and efficiency needs of the nation's air transportation system. Therefore, we believe the Congress should consider directing FAA to:

(1) revise its current acquisition strategy to incorporate a contract phase to develop and operationally test prototype models of critical components under realistic conditions before the decision and contract are made for full production quantities. At a minimum, critical components should include the controller workstation, en route AAS hardware and software, and the local communications network;

(2) reexamine the AAS features and requirements to identify the most inexpensive and cost-effective alternatives and to revalidate its requirements before proceeding to the development and testing phase; and

(3) verify the benefit estimates and the operational suitability of Aera 1 and 2 functional enhancements by operational

simulation as soon as is practicable and before proceeding with the full-scale production.

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This concludes my testimony, Mr. Chairman. I will be pleased to answer any questions that you or others may have at this time.

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OVERALL OBJECTIVES AND SCOPE OF GAO'S WORK ON FAA AIR TRAFFIC CONTROL COMPUTER MODERNIZATION PROGRAMS

In June 1983 the Chairman, Subcommittee on Transportation, House Committee on Appropriations, asked GAO to monitor FAA's implementation and management of the $12 billion National Airspace System Plan. Two GAO divisions--the Resources, Community, and Economic Development Division (RCED) and the Information Management and Technology Division (IMTEC)--are conducting this review.

The Chairman asked IMTEC to focus on the automated air traffic control programs. In June 1985, we reported[1] on FAA's short-term Host computer system and recommended that the Secretary of Transportation consider deferring the production decision and performing more realistic performance tests. In another report,[2] we expressed concern about FAA's Advanced Automation System (AAS). The House Appropriations Committee directed FAA to respond to both reports. The Transportation Secretary reviewed our Host computer concerns and determined that risks from not conducting performance testing were not sufficient to warrant delaying the Host program. A January 1986 letter to the Chairman responded to our AAS concerns stating that the AAS acquisition strategy is sound and will not be changed.

In October 1985, the Subcommittee requested us to provide our observations on the soundness of FAA's AAS investment decision from a technical, economic, and managerial perspective, including the soundness of the agency's benefit/cost analysis. The Subcommittee later asked that we also assess FAA's January 1986 response to the Chairman.

To respond to the Subcommittee's request that we review the AAS benefits and costs, we analyzed the most current benefit/cost information available. We evaluated FAA's 1982 Response to the

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[1] Federal Aviation Administration's Host Computer: More Realistic Performance Tests Needed Before Production Begins (GAO/IMTEC-85-10, June 6, 1985).

[2] GAO Questions Key Aspects of FAA's Plans To Acquire the Multi-Billion Dollar Advanced Automation System and Related Programs (GAO/IMTEC-85-11, June 17, 1985).

Congress and the 1985 unapproved draft MITRE benefit/cost analysis of the advanced automation program. Our work in the benefit/cost area primarily focused on the appropriateness and support behind claimed AAS benefits. Because AAS cost estimates were being revised by FAA, we did not attempt to validate the cost estimates used in FAA's benefit/cost analyses.

To respond to the Subcommittee's question on the technical, economic and managerial soundness of the AAS, we conducted our work primarily at Department of Transportation and FAA Headquarters in Washington, D.C., and at FAA's Technical Center in Pomona, New Jersey. We also worked at the MITRE Corporation in McLean, Virginia; Computer Technology Associates, McLean, Virginia; RCA, Moorestown, New Jersey; and Martin Marietta Corporation, Washington, D.C. We reviewed FAA, contractor, and subcontractor documents on the planning, management, and design of the AAS. We reviewed literature related to the use of performance models and discussed the use of models with an official of the Federal Computer Performance and Simulation Center. We also interviewed Transportation, FAA, and contractor officials.

Mr. BROWN. Thank you, Dr. Palmer.

Mr. Packard, do you have any questions.

Mr. PACKARD. Yes, Mr. Chairman, thank you.

You obviously feel, Dr. Palmer, that the system ought to be redesigned; that would be somewhat costly. What type of costs do you think would be incurred if we were to redesign and implement the four-phase procedures that you recommend?

Dr. PALMER. Essentially, sir, the redesign is of the acquisition strategy, not the system itself. The test and development phase that we recommend being placed in the acquisition strategy before the production decision would result in about two years of additional effort. If a second contractor is carried to conduct a competition during that phase, it would cost, in our estimate, about $200 million additional to have that second contractor.

The FAA estimates that it would cost $300 million for that second contractor for a 40-month period. Our estimate is based on a 24 to 27 month period.

Mr. PACKARD. Isn't most of the concerns with the software; what advantage is there in developing and inviting two independent software packages; and wouldn't this add substantially to the cost?

Dr. PALMER. That is what our estimate really includes. It is the development concurrently, if you have two contractors——

Mr. PACKARD. You are estimating at $200 million?

Dr. PALMER. Two hundred million dollars, yes, sir. And that would include development of the critical components, most of the basic components of the system. That is, the local communication network, the prototype controller workstation, the software, in particular, and other hardware elements.

Mr. PACKARD. If you had two processes or two packages going on at the same time, one of the purposes of—or one of the major risks is to end—well, one of the functions would be to try to avoid ending up with unusual hardware and yet if you had two systems, obviously, one would be unusable hardware; isn't that true?

Dr. PALMER. I presume that, yes, there would be some elements of hardware, perhaps, the local communication network hardware and prototype sector suites that would result, and be unusable, from the losing vendor.

Mr. PACKARD. You also raised some serious questions as to whether the AAS is even justified at this time, and suggest a reexamination of the program. Do you believe that the savings are justified; do you believe that the savings just aren't there; or do you think there are better ways and cheaper ways of doing it?

Dr. PALMER. We think first the savings, or the benefits, particularly to the airspace user community, and the intangible benefits probably do outweigh the costs. What we were considering, and looking at, were the available cost/benefit studies.

As you may know, sir, the conference on last year's continuing appropriation for FAA directed that a new cost-study be performed. What we are pointing up is, primarily, things that we saw that were weak in the last two studies, that we thought should be addressed, to make sure for the Congress that the system is economically justified.

In answer to the second part of your question, I think that the requirements for the system could be scrubbed down, particularly the primary cost drivers.

Mr. **Packard**. Thank you, Mr. Chairman. I don't really have any other questions.

Mr. **Brown**. Dr. Palmer, could you tell me something about GAO's general experience with looking at other large-scale computer-based systems, comparable in magnitude, at least dollars, to this, that we have had some experience with recently, by recently I mean the last five years or so?

Dr. **Palmer**. Yes, sir. In terms of GAO overall, we consistently report on a large number of major system acquisitions across the Government, and most of them do incorporate some form of computer software and computer technology.

Mr. **Brown**. You have referred to one here, a Navy procurement?

Dr. **Palmer**. Right; the Navy SUBACS.

Mr. **Brown**. How large was that procurement?

Dr. **Palmer**. The first phase of that procurement was around $700 million. The cost on that has grown now to $1.4 billion. Overall, however, SUBACS is a multibillion dollar program that was committed to an evolutionary pattern similar to the AAS.

Mr. **Brown**. Can you give us one or two other examples of—I am trying to elicit. I have a very vague recollection of a DOD procurement for hospital automation or medical records automation that was somewhat of a fiasco and had to be repeated.

Dr. **Palmer**. Well, TRIMIS, I think, is the one you are referring to, the hospital, military hospital, automation——

Mr. **Brown**. Remind me what happened on that.

Dr. **Palmer**. Essentially there had been several false starts on the TRIMIS acquisition over the past decade. It is currently out on contract right now to develop alternative ways of dealing with the problem, and included in that is a competitive evaluation with VA's, the Veteran's Administration's hospital management system.

The principal problems that evolved have been everything from not well-defined requirements to contractor performance problems, to cost growth, to requirements growth. It has a similar litany to many major system acquisitions.

Mr. **Brown**. Are there parallels between these acquisitions; are there comparable sets of problems that develop when we go through a major acquisition like this?

Dr. **Palmer**. Yes, sir, I think that our experience, particularly with those that involve complex computer communication and software development, they just seem to be major risk types of acquisitions. I would say that you could characterize the last five years of experience as being one of continued problems in, especially, the software delivery.

Mr. **Brown**. What was the approximate scope of the TRIMIS procurement?

Dr. **Palmer**. I think it is around $2 billion, sir.[1] I can supply it for the record. We have a report out on it.[2]

Mr. **Brown**. Well, frankly, I am asking this line of questions because I honestly don't have the background to probe into the details of your analysis of this, and I am looking for comparabilities with other kinds of systems, and I recall quite a flap over several years over the TRIMIS system.

Dr. **Palmer**. TRIMIS is a system that goes in at a large number of hospitals. It is a simpler software acquisition in one sense, in that it is not designed to be a real-time command and control system. But clearly, the problems in defining the requirements, in coming up with viable designs, it has really been a problem.

The IRS has a little more similar problem in an on-line system for their tax processing. We have reported on the problems that they have had in meeting the taxpayer's services last year.

Mr. **Brown**. And Social Security has had acquisition problems?

Dr. **Palmer**. Yes, sir; and they have never really been able to accomplish a major system acquisition at Social Security.

Mr. **Brown**. And you categorize these as somewhat simpler because they don't require real-time, or time-critical kinds of operating capabilities?

Dr. **Palmer**. Yes, sir, particularly, high availability, high processing loads, or relatively short processing times.

Mr. **Brown**. The most comparable situation would probably be within the Defense Department then where they have real-time critical command and control systems which——

Dr. **Palmer**. Yes, sir.

Mr. **Brown**. Do we have any examples or comparisons here that might be helpful in evaluating or comparing this acquisition?

Dr. **Palmer**. Yes, sir; we chose one of those—the Navy's SUBACS, because it was dependent on the local communications network. It involved some 200 processors being connected to that network. It was a multi-billion dollar program. It used some of the same features in terms of acquisition strategy in that it committed to limited production at the same time development was going on. And it experienced significant cost growth and schedule problems, and certainly performance problems.

We are looking at one at the satellite control facility in the Air Force, which is a similar kind of real-time control facility, and that one has experienced significant, cost growth and schedule delay. And they are having problems mainly with the software.

Mr. **Brown**. The one you are referring to here is that comparable in size, dollar-wise?

Dr. **Palmer**. It is smaller. It was smaller to begin with. As far as the software development, however, it was relatively the same. It just does not have as many installations, it only has the one site.

Mr. **Brown**. We haven't asked you to do an analysis of the SDI program yet, have we?

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[1] The TRIMIS Program office has estimated that the Composite Health Care System (CHCS) hardware and software costs will be between $800 million and $1.1 billion, depending upon the configuration of the computers. Current contract cost estimates, still under competitive negotiation, exceed $2 billion.

[2] GAO report to the Congress entitled "ADP Systems: Concerns About The Acquisition Plan for DOD's Composite Health Care System," March 31, 1986, GAO/IMTEC-86-12.

Dr. **PALMER**. Battle management portion, I presume, sir?

Mr. **BROWN**. Yes.

Dr. **PALMER**. Which is very software dependent. No one has asked us to do that evaluation. We are doing some preliminary work based on our own initiative to try to anticipate congressional questions in that area, because it obviously is a——

Mr. **BROWN**. That would be very similar in many ways to what we are talking about here, but considerably more time urgent and complex?

Dr. **PALMER**. Considerably, yes, sir. In addition, it has not been done before, so it represents an extremely large risk element.

The one thing about the air traffic control is that much of it has been done before, and so that much is known.

Mr. **BROWN**. My recollection in the TRIMIS system is that after we spent a few hundred millions of dollars,[3] the strategy was evaluated and a determination was made that we ought to proceed on a basis somewhat closer to what your recommendations are?

Dr. **PALMER**. Yes, sir, we are strongly in support of that additional phasing, and the Defense Department has agreed totally with that change.[4] They are phasing that acquisition now.

Mr. **BROWN**. You would probably assert that your recommendations here are based upon the experience that the government has had with complex acquisitions of this sort, and how to avoid some of the problems that you have encountered there.

Dr. **PALMER**. Yes, sir. I would also make reference, especially, to the recent Packard study for the Department of Defense, which, as you know, covered all major system acquisitions in defense and it very heartily recommends phasing of development and tests, better development testing, before committing to production, I think, basically, to save many billions—that is, we have wasted many billions of dollars by not going through a full development and test phase, before we committed to production, in defense systems.

Mr. **BROWN**. What are the pressures that lead Government agencies such as FAA, or any other, to feel that they can short circuit this process and save money; can you give me some general feel for why they would do that in the face of experience which would seem to indicate a contrary process is at least safer?

Dr. **PALMER**. I think, sir, they have a lot of confidence in their abilities to handle the problems. I think they have a lot of confidence in their ability to specify the controller workstations so well that its production will come off properly.

Mr. **BROWN**. Well, there is some basis for that confidence, isn't there?

Dr. **PALMER**. I think they believe in themselves; I admire them for that. I just basically have to be an independent advisor to the Congress, and in good conscience I cannot advise that short circuiting of the process, as you call it I think it increases the risk of the acquisition.

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[3] During fiscal years 1976 through 1984, DOD spent about $222 million to acquire, implement, and operate various stand-alone and integrated health-care computer systems. (Source: Page 1 and 16, GAO/IMTEC-86-12)

[4] See pages 3, 5, and 9 GAO/IMTEC-86-12. Third recommendation and agency comments on page 9, more details on pages 26-28.

Mr. **Brown**. But isn't the workstation designed, the part that they would seem to have the most experience with and the most capability, to make assumptions with regard to the design, and so forth?

Dr. **Palmer**. I think they have an awful lot of experience there and they have tried to include the controllers in their design of it. What it does incorporate is a brandnew philosophy of the way the controller will interact with the workstation.

Right now the controller basically has all of the heuristic functions of making decisions about conflicts, potential conflicts, and advising pilots of weather and so forth. The new work station will include a processor behind it, which will do some of the processing that currently is on the central computers. It will have to coordinate with all of the other computers that are involved in this distributed complex, and that is one of the factors that raises our concern about performance problems.

In addition, it will have new elements of data linkage and will have new elements of voice communications, new displays that have not been seen before, and not been worked with. That is one of the reasons that, we think those new displays should be operationally simulated or tested with the controller so that they can get that experience.

Mr. **Brown**. May I tell my colleagues that I have been using this time just until you arrived so that we could get some more expert questions here.

I will yield to you whenever you are ready.

Do you have any questions, Mr. Lewis?

Mr. **Lewis**. I do, Mr. Chairman. I apologize for being late.

I would like to ask a few questions, but I believe most of them I would ask them to reply in writing anyway.

Mr. **Brown**. All right, that will be fine.

Mr. **Lewis**. One of the questions that I would like to ask is isn't it a major risk in order to—that a four-phased approach seeks to avoid the risk of ending up with unusable hardware?

Dr. **Palmer**. If you were to follow a four-phased approach with a single contractor, you will tend not to end up with unusable hardware. If you carry a second competitor through the development and test phase, you will end up usually with excess equipment—particularly the prototype demonstration models.

The alternative risk in the single concurrent strategy, that the FAA has, is that if the system does not work out at the end of development and test you will have already produced all of your sector suites, some 2,000 sector suites at a cost of over a billion dollars. That is a risk of unusable hardware as well.

Mr. **Li**. I would like to add that, by carrying that second vendor, there is some impact on the risk reduction that you would have for both vendors when they provide their proposals to FAA; and that, even though I can't finger a specific quantity in terms of what that risk reduction would be, one would assume that the increased testing would help each of the vendors to sharpen their pencils a little bit better.

Mr. **Lewis**. That is a good point.

Mr. Chairman, I don't think I will ask any more questions at this point.

Mr. **Brown**. Would you like to submit some questions in writing?

Mr. **Lewis**. Yes, I would.

[The questions and responses follow:]

Mr. **Brown**. You may be getting off easy this morning, because we are anticipating that there may be a number of rollcalls; I am not sure at this point. I think in reference to your schedules we would like to excuse you at this time, and submit any additional questions in writing, if we might?

Dr. **Palmer**. We will be glad to answer them.

Mr. **Brown**. And then we will just impose on the second group of witnesses to see how soon we can get back from these roll calls.

Thank you very much, for your excellent testimony. We will, of course, scrutinize it very carefully and use it to try and sharpen our analysis of the FAA's program, and particularly the budget request. Of course, that is the reason we call on you for this kind of advice.

Dr. **Palmer**. Thank you, sir.

Mr. **Brown**. Thank you very much.

The subcommittee will be in recess until we find out how much disruption we are going to have this morning.

If the worse scenario prevails, we may have to postpone the remainder of the morning session, but I am not prepared at this point as to just exactly what is going to happen. I am told there may be a series of rollcalls aimed at disrupting the proceedings of the House, in which case it would be difficult to conduct the remainder of the hearing this morning.

Thank you very much, Tom, we will be in recess temporarily.

[Recess.]

Mr. **Brown**. The committee will resume its sitting.

We welcome Admiral Engen and his staff here this morning. We are going to proceed with your testimony Admiral Engen, and we will promise to get you out of here prior to 11 o'clock. Your staff can continue with whatever additional questions we might have at that point.

You may proceed with your statement.

STATEMENTS OF ADM. DONALD D. ENGEN, USN (RETIRED), ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION, ACCOMPANIED BY NEAL A. BLAKE, DEPUTY ASSOCIATE, ADMINISTRATOR FOR ENGINEERING; FRANK L. FRISBIE, ACTING ASSOCIATE ADMINISTRATOR FOR DEVELOPMENT AND LOGISTICS; VALERIO HUNT, DIRECTOR, ADVANCED AUTOMATION PROGRAM OFFICE; DALE McDANIEL, DEPUTY ASSOCIATE ADMINISTRATOR FOR ENGINEERING; AND MARTIN POZESKY, ACTING DEPUTY ASSOCIATE ADMINISTRATOR FOR DEVELOPMENT AND LOGISTICS

Admiral **Engen**. Thank you, Mr. Brown—Mr. Chairman, I really do appreciate that very much, your consideration.

In keeping with that I would reduce my comments, submit my statement for the record, and try to hit some of the high points, here.

Mr. **Brown**. It will be included in full at this point.

Admiral **Engen**. I am pleased to have the opportunity to meet with you and members of this subcommittee to discuss FAA's national airspace system plan and our 1987, RE&D Program, Mr. Chairman.

With me, on my immediate right are Frank Frisbie, the Acting Associate Administrator for Development and Logistics. On his right, his deputy, Martin Pozesky. And on my left Mr. Neal Blake, the Deputy Associate Administrator of Engineering. At the end of the table down here is Mr. Val Hunt, Director of Advanced Automation Program Office.

I also have Mr. Dale McDaniel sitting in the row behind me, Deputy Associate Administrator for Policy. They have prepared detailed briefings on the status of the NAS plan and our activities.

As this subcommittee knows, the FAA developed the NAS to replace outmoded and labor-intensive facilities and equipment to enhance safety, increase system capacity and improve the timeliness and dissemination of weather data to serve the air transportation industry into the year 2000. The projected cost of this effort, including the terminal Doppler weather radar, is $12.2 billion. The FAA will realize the substantial benefits from this investment through lower labor and other operating costs.

Savings will accrue to aviation users through improved service, reduced delays and more fuel-efficient routing. We have made considerable progress in our NAS plan accomplishments during fiscal year 1985. We obligated $1.2 billion of facilities and equipment appropriations. This is more than three times the amount ever obligated in a single year. By the end of the fiscal year 1985, we had awarded some 68 percent of the major equipment contracts that are associated with the implementation of the NAS plan.

Critical elements of the NAS plan remain essentially on schedule in fiscal year 1986. Some of the more significant accomplishments are as follows; and I will just quickly go down them.

The acquisition contract of the Host computer, the first phase of the Automation Modernization Program, was awarded to IBM for $197 million. This program will replace the existing computer hardware with state-of-the-art computer systems that will initially utilize current software, provide additional computer capacity, and improve the reliability of the en route systems.

The advanced automation system is proceeding through the design competition phase leading to an acquisition award in January of 1988. The major cost item during this phase will be the demonstration and testing of preproduction sector suites. This element of the system embodies a significant portion of the cost of the later acquisition phase contract.

The House joint resolution on further continuing appropriations for fiscal year 1986, directed the FAA to conduct a thorough and independent cost/benefit analysis to support the advanced automation system acquisition. This study is, indeed, in progress.

Negotiations are essentially complete, and award of the prototype contracts for the voice switching and control system is scheduled for this summer.

The model I flight service automation system has been delivered to nine locations. A $55 million contract was awarded for 17 airport surface detection radar units with an option for 13 more.

A 5-year contract was awarded for procurement of 312 microwave link installations, with options for 692 additional sites. This system will transmit better voice and data communications, at lower cost.

A contract was awarded in March of 1986, which will add new displays and processing power to the New York TRACON. This system will increase our capacity at this busy facility.

Prototype test phase of the Next Generation Weather Radar Program is proceeding well. The tests will be completed during fiscal year 1986 and contract award for the contract limited production system is expected in January of 1987.

The 1986 edition of the NAS plan, will include a new project for the terminal Doppler weather radar. Fifteen systems are included in the fiscal year 1987 budget.

After some startup difficulties, we are preparing to complete the design of the automated weather observation system. This contract has an option for 206 production systems, commencing delivery in April 1988.

The low-level wind-shear alerting system at 110 airports is being completed, and R&D efforts leading to a definition of an enhanced system has been conducted.

Every plan, every large plan attracts proponents and opponents. These polarized groups are forces which tug at the entity of the organization which is charged with completing that plan. This is a philosophical and, I believe, organizational fact of life.

The NAS plan is really no different. It is a broad plan previously approved by the President and by Congress. Its goal is to bring about major improvement in the ability to move to improve air commerce in these United States. We are seeing many forces trying to alter that plan for valid reasons, or at least valid in the eyes of those trying to bring about that change.

The budgeteers are questioning the validity of the plan because of budget pressure. The auditors are challenging validity because of pressures brought to bear by Congress and industry. The goal of the FAA is to implement the approved plan.

It is very difficult for my people to remember that our goal is to drain the swamp, to achieve greater aviation capability when all those fiscal alligators are out there chomping at some of our major programs.

We in the FAA are resolute in our desire to complete the NAS plan; and I certainly am dedicated to that.

As far as Secretary Dole and I are concerned, it is only "when" is it going to be completed.

An unfortunate fact of life is that when you must accommodate to changes in the approved plan as you proceed, you do incur delay, and this delay does increase the cost. The planned cost savings do begin to disappear.

The FAA's 1987 request for facilities and equipment appropriation is $825 million, some $125 million less than fiscal year 1986 level, and considerably below the authorization level.

We plan to accommodate these reductions through a series of management actions aimed at keeping critical elements of the NAS plan essentially on schedule. These management actions include: Selectively taking three projects off full funding in fiscal year 1987;

referring some lower priority modernization or improvement projects for future years; adjusting the quantities of some projects as opposed to deleting complete programs.

The most critical modernization projects such as terminal radar replacement, Host computer, advanced automation, mode-S, MLS, and Nexrad, are proceeding as planned. These projects were given priority because they contained the largest capacity, productivity and safety payoffs.

Other assessments include contract, program, and technical impacts. In the near time, these management actions have eased the impact of the funding restrictions.

Reductions are, however, contributing to the buildup of resources required in the future for the completion of our plan. One of the greatest problems that we have is the increasing cost of implementing the plan as a result of the logs that seem to be rolled in our way as we move down the path towards implementation.

With respect to research engineering and development programs, with the funds provided by Congress we have undertaken a variety of key research and development activities in the area of aviation safety and security.

In fiscal year 1985 the FAA sponsored investigations on new concepts for explosives detections. Design studies are being conducted now on the development of an advanced thermal neutron detection system for baggage and cargo inspection. A chemiluminescence detector is currently under development.

Significant progress has also been made in the wind shear program, the contract was awarded in fiscal year 1986 to a team of companies to develop a comprehensive pilot training program for wind shear. And I look forward to great benefits from this.

Our 1987 budget proposes a $134.5 million amount for FAA research, engineering and development activities, or $55 million less than enacted last year. Essential elements of the NAS plan-related projects, as well as the technical RE&D support of regulatory activities in the areas of aircraft safety, aviation medicine, aircraft noise and pollution, are being funded from the levels of the President's budget request. This includes necessary RE&D funds for the advanced automation system, voice switching and control system, advanced en route automation system, aircraft safety and aviation security.

Additional work in fiscal year 1987 will include efforts to improve acquisition, distribution, and display of weather data; the evaluation of navigation systems; aviation environmental protection; medical research into aircrew and passenger protection; as well as controller performance.

In summary, Mr. Chairman, we will experience modest slippage in some programs, but on the whole the NAS plan and our research, engineering and development programs have not been significantly altered. The funding levels will allow us to continue those programs to increase safety, efficiency, and capacity of the Nation's airway system.

Our top priorities are to insure continued progress in the important safety programs, and to protect the key accomplishments of the national airspace system plan. We will manage this program in a way that continues to recognize its high priority within the agency and the aviation community as a whole.

Mr. Chairman, this does conclude my prepared remarks that were kind of given extemporaneously here. I would be very pleased to respond to your questions.

[The prepared statement of Admiral Engen follows:]

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STATEMENT OF THE HONORABLE DONALD D. ENGEN, FEDERAL AVIATION ADMINISTRATOR, BEFORE THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS, CONCERNING THE NATIONAL AIRSPACE SYSTEM PLAN AND THE RESEARCH, ENGINEERING AND DEVELOPMENT PROGRAM, APRIL 23, 1986.

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before you today to discuss the Federal Aviation Administration's National Airspace Systems Plan (NAS) and our FY 1987 Research, Engineering and Development programs. With me are Frank Frisbie, the Acting Associate Administrator for Development and Logistics; his Deputy, Martin Pozesky; Neal Blake, the Deputy Associate Administrator for Engineering; Val Hunt, Director of the Advanced Automation Program Office; and Dale McDaniel, Deputy Associate Administrator for Policy and International Aviation. They will review the status of the NAS Plan and our fiscal year 1987 RE&D activities.

As this Subcommittee knows, the FAA developed the NAS Plan to replace outmoded facilities and equipment, increase system capacity, and to improve the timeliness and dissemination of weather data to serve the air transportation industry beyond the year 2000. The Plan is a blueprint, involving substantial capital investments, for achieving increased safety, capacity, productivity, and economy in the operation of the Nation's air traffic control and air navigation system. These goals will be achieved through: higher levels of automation, facility consolidations, and use of new telecommunications technology.

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We are committed to a program that will include the new terminal Doppler weather radar as well as other technological advances to assist controllers in their jobs and expand system capacity while ensuring safety. The FAA will realize substantial benefits from this investment through lower labor and other operating costs. Savings will accrue to aviation users through reduced delays and more fuel efficient routing. We have made considerable progress toward achieving our NAS Plan goals.

NAS PLAN ACCOMPLISHMENTS

During fiscal year 1985, we obligated $1.2 billion of Facilities and Equipment appropriations. This is more than three times the amount ever before obligated in a single year. By the end of fiscal year 1985, we had awarded about 68 percent of the major equipment contracts that are associated with the implementation of the NAS Plan. Critical elements of the NAS Plan remain essentially on schedule in FY 1986. Some of the more significant accomplishments are as follows:

- An acquisition contract for the Host computer, the first phase of the automation modernization program, was awarded to IBM for $197 million. This program will replace existing computer hardware with state-of-the-art computer systems which will initially utilize current software, provide additional computer capacity, and improve the reliability of the en route systems. Formal capacity testing of the Host computer is scheduled to begin in July 1986. However, preliminary tests indicate that the forecasted 1995 traffic levels can be easily handled by the Host computer. It is our opinion, based on these tests, that the concerns expressed by the General Accounting Office that the Host computer will not provide sufficient capacity are unwarranted.

- The Advanced Automation System is proceeding through the Design Competition Phase leading to an acquisition award in January 1988. The major cost item during this phase will be the demonstration and testing of preproduction sector suites. This element of the system embodies a significant portion of the cost of the later acquisition phase contract. The House Joint Resolution on Further Continuing Appropriations for Fiscal Year 1986 directed the FAA to conduct a thorough and independent cost-benefit analysis to support the Advanced Automation System acquisition. This study is in process.

- Negotiations are essentially complete, and award of the prototype contracts for the Voice Switching and Control System is scheduled for this summer.

- The Model I Flight Service Automation System has been delivered to nine locations. The initial Model I commissioning occurred in February 1986 at the Cleveland family of facilities. The FAA is actively considering using the private sector to provide direct access user telephone services to take advantage of existing technology. Although the procurement approach is still under consideration, we anticipate that the system could be implemented within 30 months after approval of the acquisition strategy.

- A contract with a total value of $221.8 million awarded in October 1984 for 78 Mode-S ground stations with an option for 59 more. Mode-S will provide more accurate positional information and reduce radar beacon interference.

- A $55.6 million contract was awarded for 17 airport surface detection radar units with an option for 13 more. This new solid-state equipment will have a greater capability to penetrate heavy precipitation and present a cleaner, sharper radar picture under all light conditions than is now available from the present equipment.

- A contract for design, development, and first-article production of the remote maintenance monitoring equipment for Instrument Landing Systems (ILS) was awarded for $10 million. This is the first phase of a two-phase contract. The second phase will be for production quantities sufficient to retrofit all Category I ILS's.

- A Microwave Landing System (MLS) implementation contract was awarded for $90.6 million in 1984 to provide 172 systems. The contractor successfully completed the critical design review in 1985, and funding of $22.8 million was provided for the third-year procurement quantity under this contract. MLS will provide more precise landing guidance than the present ILS.

- In the National Radio Communications Systems (NARACS) program, a $15.4 million contract was awarded to procure equipment for regional communications networks. The NARACS provides essential communications capability to support DOT and DOD missions during a national, regional, or local emergency when leased common carrier telecommunications services are interrupted.

- A 5-year contract was awarded for procurement of 312 radar microwave link installations with options for an additional 692. The initial order value is $49.2 million and there are options that could bring the total contract value to $188.2 million. This system will transmit voice and data communications, providing better services at lower costs.

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- A contract was awarded in February 1985 for prototype development of the necessary hardware and software modifications to allow Automated Radar Terminal System-IIA (ARTS IIA) to accept Mode S sensor data. Award of the production contract is expected in July 1986.

- A contract was awarded in March 1986 which will add new displays and processing power at the New York TRACON. This will increase system capacity at this busy facility.

- A hazardous in-flight weather advisory system is operational in three air route traffic control center areas. The system will be implemented nationwide in FY 1987. This system provides forecast information on severe weather, in the form of significant meteorological data (SIGMET's), and current updates on severe weather hazards in the form of Center Weather Advisories.

- The prototype test phase of the Next Generation Weather Radar (NEXRAD) Program is proceeding well. The tests will be completed during FY 1986 and contract award for the limited production system is expected in January 1987.

- The 1986 edition of the NAS Plan, when published, will include a new project for the terminal Doppler weather radar. Fifteen systems are included in the FY 1987 budget. These 15 units will be a terminal derivative of the NEXRAD. First delivery is expected in FY 1989. A competitive procurement is planned in FY 1988 for a terminal Doppler Radar System designed specially for the terminal environment. The 15 terminal derivatives of NEXRAD will be returned to the NEXRAD configuration.

- After some start-up difficulties, the terms of the AMEX contract were renegotiated to complete the design of the Automated Weather Observation System. This contract has an option for 206 production systems, commencing delivery in April 1988.

- Implementation of the Low Level Wind Shear Alerting System at 110 airports is being completed. Research and development leading to definition of an enhanced system has been conducted. A contract award for the enhanced system is currently scheduled for February 1988 with delivery scheduled to begin in 1989. The enhanced system will have additional sensors for improved processing, data recording and archiving, and improved display formats.

The FAA's FY 1987 request for the Facilities and Equipment appropriation is $825 million--$125 million less than the FY 1986 level, and considerably below the authorization level. We plan to accommodate these reductions through a series of management actions which, I believe, will keep critical elements of the NAS Plan essentially on schedule. These management actions include:

- Selectively taking three projects off full funding in FY 1987.
- Deferring some lower priority modernization or improvement projects for future years.
- Reducing the quantities on some projects, as opposed to deleting complete programs.

The more critical modernization projects, such as terminal radar replacement, Host computer, advanced automation, Mode S, MLS, and NEXRAD are proceeding as planned. These projects were given priority because they contain the largest capacity, productivity, and safety payoffs. Other assessments included contract, program, and technical impacts.

RE&D PROGRAMS

With the funds provided by the Congress, FAA has undertaken a variety of key research and development activities in the area of aviation safety and security:

- Significant progress has been made in the wind shear

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area. A contract was awarded during 1986 to a team of companies to develop a comprehensive wind shear pilot training program. This program will develop a course of instruction on recognition and avoidance of wind shear, and piloting techniques that will provide the best performance from an aircraft should wind shear be encountered.

- Design studies are being conducted during FY 1986 on the development of an advanced thermal neutron detection system for the detection of explosives in baggage and cargo.

- A chemiluminescence detector is currently under development. This detector will operate in conjunction with the portal screening systems to detect vapors from explosives carried on the passenger's person.

- In FY 1985 and 1986, the FAA sponsored investigations on new concept studies for explosive detection. The most promising of these concepts will become candidates for breadboard system development and tests.

Our FY 1987 budget proposes $134.5 million for FAA research, engineering and development activities or $55.5 million less than last year. The essential elements of the NAS Plan related projects, as well as technical support of regulatory activities in the areas of aircraft safety, aviation medicine, aircraft noise, and pollution, are being funded within the levels of the President's budget request. About 67 percent of the funding request addresses four major programs: the Advanced Automation System (17 percent); the Voice Switching and Control System (25 percent); aircraft safety (17 percent); and the Advanced En Route Automation System (9 percent).

Additional work in FY 1987 will include efforts to improve the acquisition, distribution, and display of weather data; the evaluation of navigation systems; aviation environmental protection; medical research into aircrew and passenger protection; and controller performance.

In summary, we will experience modest slippage in some programs but, on the whole, the NAS Plan and our research, engineering and development programs have not been significantly altered. The funding levels will allow us to continue those programs to increase safety, efficiency, and capacity of the Nation's airway system. Our top priorities are to ensure continued progress in important safety programs and to protect the key accomplishments of the National Airspace System Plan and are doing all we can to manage this program in a way that continues to recognize its high priority within the agency and the aviation community as a whole.

Mr. Chairman, this concludes my prepared remarks. Later in this hearing Martin Pozesky, Val Hunt, and Neal Blake will provide more details on major NAS Plan projects and the various RE&D programs. With your permission, I would like Mr. Frisbie to discuss our Fiscal Year 1987 RE&D and NAS Plan resource requirements. After his briefing, we will be pleased to respond to your questions.

Mr. **Brown**. Very good, we appreciate that, Admiral Engen.

As you have pointed out we have two conflicting sets, not necessarily conflicting, but apparently conflicting sets of testimony here. One focusing on the need to proceed more expeditiously and with full funding on many of these programs, and lamenting the failure to proceed with expenditure of the trust fund money both for facilities and equipment and research and development activities.

The other represented by the GAO, commenting on the hazards of proceeding too rapidly, or at least without adequate procedures and systems to avoid making serious errors.

These two points don't necessarily conflict, but they do put two different kinds of pressure on us. And it is the role of Congress and this committee to try and sort this out in some appropriate fashion. We will try to do our best to achieve this.

Mr. Lewis, do you have questions?

Mr. **Lewis**. Thank you, Mr. Chairman.

Admiral, you state that you are taking three projects off the full funding. How great is the risk that these projects might be terminated before they are fully funded?

Admiral **Engen**. Mr. Lewis, I would like say that I think minimal. We did this with great deliberation. We did it in order to keep more programs coming in the NAS plan and the dollars available. I feel very confident that those programs which are terminal Doppler weather radar, the ASR-9, and our microwave communications, are vital to our plan. We are dedicated to them. They will be funded in years subsequent.

Mr. **Lewis**. Do you anticipate having to remove any other projects from funding at this point?

Admiral **Engen**. I don't want to cast-in-stone and reduce my flexibility completely. I always have to deal with the dollars available, and if in its wisdom the budget is given me, as it is now, I don't anticipate additional projects being dropped off, but I would like to retain that flexibility to do that if I must.

Our goal is to retain full funding, truly. I think that the administration, OMB, Congress wants us to remain on full funding. We, the FAA, want to remain on full funding.

Mr. **Lewis**. Some serious concerns have been raised about the automated systems. You already had a redesign with the system. Can you tell us how confident you are that you won't be facing some additional major redesigns in the system; and how do you plan to conduct your operational test prior to committing to production?

Admiral **Engen**. I would like to let Mr. Frisbie talk about the latter part about conducting operational test prior to——

Mr. **Lewis**. This is probably the most interesting—

Admiral **Engen**. Yes, sir.

Mr. **Lewis** [continuing]. And the concern of most general aviation pilots, as well as the whole system.

Admiral **Engen**. Yes, sir. Let me say, Congressman Smith—excuse me, Congressman Lewis—

Mr. **Lewis**. He is from Oregon.

Admiral **Engen**. Yes.

That we are very dedicated to that greatly increased capability. It is almost a four-times capability that we are going to be able to have with the advanced automation system.

We are very concerned about the development of software. Software in industry is probably one of the the current frontiers, and it is that software development that gives us the most concern. It costs money to develop lines of software. And you find as you are developing software that there is need for patches, so we are going to have to walk our way through this development.

It is very key, though, to the enhanced capability of the system. It is very important that it be brought on time, in time. It is very important that the Host computer be used in a way that NAS automated software can come along and dovetail in.

We are seeing traffic volumes compounding at about 3 percent per year. I don't know that that is going to continue forever or the nearterm. And we need to get ready for that.

I feel very confident, Congressman Lewis, that we will manage this very strictly, and that we will be able to develop the software.

But with respect to the amount of changes in the software, I would ask Mr. Frisbie to talk a little bit now about what he sees as some of our problems in this area, and also talk about our testing.

Mr. **Frisbie**. Mr. Lewis, I am not sure what you referred to when you talk about a redesign. The only thing that we have done is in the acquisition phase, which is the phase that we are in with two contractors.

Mr. **Lewis**. I heard yesterday that you had some——

Mr. **Frisbie**. Excuse, me, the design competition phase, I beg your pardon. We have added some requirements to that phase. And one of those is the requirement that color displays be included in that phase. So, that has caused contractors to design to those new requirements—but at least, in my jargon, sir, that would be a major redesign. So that we are proceeding directly through that design competition phase for the advanced automation system.

There is a major milestone which occurs in January 1987—excuse me. January of 1988—wherein we would face the production decision. At that time we will have in hand the new costs study that is being done at the direction of Congress, and we will have completed some very extensive testing. And if we get an opportunity later in this hearing, Mr. Chairman, we will be presenting an overview of how we are prosecuting that program.

But we think that there is sufficient testing to mitigate risk in this design competition phase, and that when we do commit to production, we can do so with very great confidence.

Mr. **Lewis**. You don't feel you have any great problems by committing to production without any operational test whatsoever——

Mr. **Frisbie**. Well, we will have——

Mr. **Lewis** [continuing]. Any major type of designs in the system?

Mr. **Frisbie**. Well, we will have, we think, rung out the primary cost driver in the acquisition phase, that being the sector suite. The sector suite accounts for two-thirds of the cost in the acquisition phase. We will have rung that out very extensively when we make the production decision.

The alternative, which GAO seems to favor, is to continue the program with two contractors for about 24 months, for both of the contracts to write some or all of the million lines of code that would be required to have full prototype, if you will, and to do that at a cost of about $400 million. We think the fact that we have two contractors who are willing to take the biggest part of this job at fixed price, speaks very well for their confidence, and our confidence about mitigating risk.

Mr. LEWIS. One other question, Mr. Chairman.

Admiral, can the FAA maintain the NAS schedule with the current funding profile?

Admiral ENGEN. The simple answer is no. I think that what you see us doing is slipping in the outyears some of those less vital functions, equipments that are needed. You can't do something with nothing. And as pressures are brought to bear on our budget, and the administration supports the goals of Gramm-Rudman-Hollings, we want to reduce our cost of operating as much as possible. But as we do that, that does have a direct impact upon the NAS plan.

What I said in my initial comment was that we are maintaining those key things up front, though, and maintaining the schedule to bring on the Host computer, the advanced automation system, long-range radars, those things that we see are needed for safety.

What will slip will be the completion date of the plan. That doesn't change my dedication, my complete dedication, though, to implementing the plan. It will be done in time, sir.

Mr. LEWIS. Thank you, Admiral.

Mr. Chairman, I have some additional questions that I would like to have answered in writing, including, I would like to have the Admiral's response to the GAO report.

Admiral ENGEN. Yes, sir.

[The questions and responses follows:]

FAA RESPONSE TO GAO INTERIM REPORT

IMTEC - 85 - 11

December 1985

Department of Transportation
Federal Aviation Administration

Office of the Associate Administrator
for Development & Logistics
800 Independence Ave., S.W.
Washington, D.C. 20591

DOT/FAA/AAP-85-13

FAA Response to GAO Report IMTEC-85-11

The Appropriations Committees of the House of Representatives and of the Senate have recently expressed concerns about the issues identified in GAO's interim report on the subject of the FAA's Advanced Automation System (AAS) and Automated En Route Air Traffic Control (AERA) Program (Report GAO/IMTEC 85-11, June 17, 1985). This response, prepared at the request of the Appropriations Committees, addresses the issues raised in that report.

GAO Concern 1 - GAO contends that FAA will not perform any developmental and performance tests of AAS hardware and software prior to the selection of an AAS Production Contractor. As a result, this may compromise the degree of confidence in meeting operational performance requirements. In addition, it is contended that FAA will not have confirmed that its sector suite meets man-machine interface requirements. There is also the belief that the FAA acquisition strategy is not consistent with OMB Circular A-109, which suggests four stages in major system acquisition, including concept exploration, concept demonstration, full-scale development and, finally, production.

FAA Response to Concern 1 - In 1981, the FAA selected a structure for the Advanced Automation Program consisting of three phases--Host, Initial Sector Suite System (ISSS), and full Advanced Automation System (AAS). A strategy consisting of an acquisition for Host and a second acquisition for AAS was selected to implement the elements of this three phase program. This approach was presented to the Congress in 1982 in Response to Congressional Recommendations Regarding the FAA's En Route Air Traffic Control Computer System (Report DOT/FAA/AAP-82-3), and a complete rationale for the program structure and acquisition strategy was presented to the House and Senate Appropriations Committees earlier this year in Response to Congressional Concerns Regarding FAA's Advanced Automation Program for Air Traffic Control (Report DOT/FAA/AAP-85-1).

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In the AAS acquisition, the FAA has awarded two (competing) contracts for the design of the AAS and the development of sector suite and tower position console prototypes. After a critical design review and a demonstration of the console prototypes, one contractor will be selected to implement the ISSS's and AAS's.

The FAA believes that the reasons cited for this AAS acquisition strategy are still valid and does not agree with the GAO conclusions cited in concern 1. The FAA believes that the AAS acquisition strategy appropriately balances risks with costs and benefits and complies fully with the philosophy of OMB Circular A-109 and the Department of Transportation's (OST) implementing directive, DOT 4200.14B. At the end of the Design Competition Phase (DCP), the sector suite and tower consoles (which represent nearly all hardware except commercial computer equipment) will have undergone sufficient testing, including interactive operational evaluation, to warrant proceeding with console production. Early and continued deep controller involvement throughout the DCP, culminating in these tests, will have ensured that the console hardware meets man-machine interface requirements. The console test results, complemented by the AAS design documentation and supporting analysis, will provide the FAA with adequate information to select an AAS production contractor.

Moreover, extending the DCP to include full AAS prototype demonstration would delay ISSS, AAS, and AERA implementation by 3-4 years at an additional cost of $300 million and with a loss of $3.83 billion of benefits to the FAA and its user community.

Discussion of Concern 1

1. Background - Three major points need to be recognized in a discussion of a strategy for moving from today's ATC automation to a Host, an ISSS, and then an operational AAS to contain the AERA-1 functions and provide the foundation for terminal consolidation, and the subsequent implementation of additional AERA functions.[1] First, the predominant lesson learned from the replacement

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[1] For a detailed discussion of this system evolution see DOT/FAA/AAP-85-1.

of other large systems has been that incremental replacement is far more likely to succeed than total system replacement in a single step. Second, the major risk in the AAS Program is that of providing for transition without any detrimental impact on providing ATC services. Again, manageable steps are necessary. Third, the development of software does not stop after hardware development is completed and initial system testing is conducted, but continues throughout the implementation phase until the total system is fully integrated and operational in the field. Since the AAS is a software intensive system with computer hardware essentially off the shelf, the acquisition strategy must give recognition to the software development cycle.

2. The AAS Design Competitive Phase (DCP) - The AAS acquisition strategy has been specifically structured to accommodate a multiple step transition, to accommodate a single software development cycle, and to minimize cost and schedule without risk compromises.

During the DCP, the FAA strategy provides a demonstration/test of the console hardware prior to a production decision and provides a system design that supports a long system life. The sector suite and tower position consoles represent almost the entire investment in hardware that is produced specifically for the ISSS's and AAS's and is approximately three times the investment in software and off-the-shelf computer hardware that will be procured as part of the AAS. The demonstration/test requirements of the consoles have been structured to ensure that the hardware will meet both man-machine interface and maintenance requirements, and the FAA is confident that these tests are fully adequate to make a production decision.

During the DCP, the evolving designs of the sector suites and the tower position consoles will be demonstrated three times. The three demonstrations are: the Mock-Up Demonstration, the Display Entry Device Demonstration, and the Prototype Demonstration. For each of these demonstrations, the FAA has specified: (1) the subset of AAS requirements that the demonstration item must meet; (2) the minimum required features of the demonstrated item; and (3) requirements on the content and conduct of each demonstration.

For each demonstration, the FAA specified that the test requirements include demonstration of how the evolving design complies with man-machine interface and maintenance requirements. These demonstrations permit assessment of both the status of the console development and the adequacy of the human engineering aspects of the design as the design is evolving. For the final demonstration, the Prototype Demonstration, the prototype sector suites and tower position consoles will have all devices in place, look and perform like production sector suites and tower position consoles. In addition, the data used in the demonstration will be representative of air traffic control data, and the data patterns (formats) used will be in agreement with the final sector suite and tower position console designs. This environment will allow FAA observers and participants to evaluate the sector suite and tower position console designs in a realistic environment.

The controller team that worked with the Advanced Automation Program Office to define man-machine interface requirements and the DCP console test requirements is actively involved in the review of the DCP contractor reports and products. The team played a major role in the console mockup demonstrations conducted last summer and will be actively involved in the interactive tests and operational evaluation of the console design during the prototype demonstrations.

A number of steps are being taken to ensure that the computer hardware/software system design will meet the FAA's needs:

(a) The FAA will procure AAS computer hardware in accordance with the guidelines established by the General Services Administration. That is, the initial hardware complement will be procured during the AAS acquisition phase to meet the needs for only the first years of the system's life. Thereafter, hardware elements will be upgraded or replaced as dictated by traffic levels and ATC requirements. To support this approach, the AAS DCP contractors will develop life cycle capacity management plans.

(b) To ensure that the system will meet performance requirements both in the initial configuration and in future configurations, performance models are being developed and exercised.

(c) In the system design, the contractors will perform analytic studies to show how the design can be extended to accommodate future functional evolution, particularly in advanced ATC automation (AERA).

(d) To provide a basis for evolution, the initial AERA functions (AERA-1) are being included in the initial AAS implementation and the AAS Acquisition Phase Contractor who developed AERA-1 will be responsible for design, development, and follow-on implementation of AERA-2 as the first incremental step in the continued evolution of advanced automation functions in the AAS.

In summary, at the end of the DCP, the FAA and its contractors will have completed tests of the critical hardware to be produced in the acquisition phase and will have a flexible computer hardware/software system design that has been demonstrated to support air traffic control not just on the first day of operation but throughout a 20-30 year evolution. This will give the FAA adequate information to make a selection of an AAS production contractor.

3. Risks of the FAA Acquisition Strategy - Clearly, every new development program involves some risk, and it is appropriate to explore what is at risk in the FAA's AAS acquisition strategy. Five risk areas that must be considered are: transition risk; software risk; console hardware risk; system extensibility risk; and system performance risk. The following paragraphs present, in each of these areas, the relative risks for the FAA's acquisition strategy and the alternate strategy of complete AAS prototype development and test in a design competition.

Transition and software are two of the highest risk areas in the development and implementation of the AAS, regardless of the acquisition strategy selected.

One factor that must be considered in assessing risks in these two areas is the difference in the role the FAA can play when it deals with only one contractor instead of two competing contractors. For reasons of fairness, when two contractors are competing, the Government must retain a passive attitude during a design competition and comments must be limited to contract (i.e., requirements) compliance.

In a one contractor environment, the Government can become a more active partner to the contractor and provide design guidance in its areas of expertise. In the areas of transition and software, especially as it affects the user interface, the FAA can evaluate software characteristics as they are observed in extensive FAA Technical Center tests and direct the design adjustments to achieve a product that is operationally acceptable to the users. For these reasons, software risk will be lower with the FAA's acquisition strategy.

In the first years of the AAS acquisition phase, a complete ISSS prototype will be integrated and installed at the FAA Technical Center. This prototype will be used to perform extensive man-machine interface tests so that any problems can be identified and corrected before field installation. The FAA has structured the DCP console test requirements to identify those man-machine interface deficiencies due to console hardware before console production begins. It is, therefore, expected that the man-machine interface deficiencies uncovered in the ISSS Acquisition Phase test will require only software modification. Thus, the console hardware risk associated with the FAA's acquisition strategy, that is, the risk that modification to the console hardware will be required after production begins, is minimal.

In both the areas of system extensibility and system performance, the assessment of whether requirements are being met and subsequent correction of problems is an iterative process that begins early in the design and continues until a system is implemented. In a computer system where hardware is never expected to change, a prototype or upgradability test before a production decision (as was done in the case of Host) is important for ensuring adequate system performance. On the other hand, in a system where hardware change and software growth for new functions are the rule rather than the exception, emphasis must be on the design activity, supported by modeling, to ensure that the system can be extended into future potential system hardware/software configurations and that all of these configurations meet performance requirements. Actual performance tests will be conducted on the initial system prior to a field installation decision so that a final determination of the specific complement of computers needed at each field site can be made.

Because meeting AAS extensibility and performance goals are more dependent on this iterative design process than on a single set of performance/growth tests, neither of the two acquisition strategies offers a significantly lower risk in the extensibility and computer performance areas. Actually, it can be argued that the risks are somewhat lower in the FAA's approach because the FAA can work closely with the acquisition phase contractor in the assessment and resolution of problems uncovered during testing, particularly in functional, interface, and operational areas.

4. Cost/Schedule Impact of full prototype competition - The FAA's acquisition strategy will lead to operational readiness of both the ISSS and the AAS at the earliest practical time (see figure 1). If a production decision is deferred until AAS prototype tests are completed, ISSS and AAS implementation would be deferred by 3-4 years. Figure 2 shows the critical path of activities required if full competitive AAS prototype tests are conducted. A comparison of figures 1 and 2 shows that the first site Operational Readiness Demonstration (ORD) would be deferred from May 1991 to September 1994 for ISSS and from May 1993 to September 1996 for AAS. AERA-2 would be deferred accordingly since it is not operationally feasible to introduce a major AAS upgrade like AERA-2 until operational stabilization for AAS and AERA-1 has been completed. The FAA estimates that this stabilization will require approximately 2 years. In sum, the design competition would be extended by 40 months and the benefit of ISSS, AAS, AERA-1, and AERA-2 would all be deferred by 40 months.

The alternate acquisition strategy leads to a development cost increase of $300 million, a loss of benefits of $975 million to the FAA and of $2.85 billion to the user community, with little reduction in risk.

5. Adherence to OMB Circular A-109 - The FAA believes that while its acquisition strategy may not precisely implement each of the steps provided for in A-109, it does, in fact, observe the philosophy of A-109 and DOT Order 4200.14B, which governs the acquisition of a major system within the Department of Transportation. The acquisition strategy being used for the Advanced Automation Program was reviewed and approved by the Deputy Secretary of the Transportation Systems Acquisition Review Council (TSARC) on April 6, 1983, as required by OMB Circular A-109 and DOT Order 4200.14B.

It should also be noted that the FAA has an independent Operational Test and Evaluation (OT&E) Staff which functions independent of the Advanced Automation Program Office. It has been chartered to overview the full range of interactive operational and developmental testing that will be undertaken within the AAS Program as well as other FAA National Airspace System (NAS) major system acquisition programs. The OT&E staff reports directly to the Deputy Administrator of the FAA. Thus, safeguards have been institutionalized within the FAA acquisition process that require the OT&E staff to provide an independent assessment of the operational readiness of a system before making the decision to go into full production.

GAO Concern 2 - The FAA will not perform some planned simulation tests of AERA-2 prior to including the specifications in the AAS acquisition contract and that the FAA's future plans to test and validate AERA specifications are uncertain at this time. If the FAA does not conduct developmental tests of AERA functions, it will not have the benefit of the test information that would better assure that the functions will be useful to controllers.

FAA Response to Concern 2 - The FAA has invested over 200 labor years of research on AERA in the past 10 years. This research included significant experimentation and user involvement. As a result, the FAA has confidence in the viability and benefits of the concept embodied in the AERA-2 draft specification that was developed in 1985 and which will be finalized in 1986. The FAA is currently involved in the detailed planning of the activities that will be necessary to take the established AERA-2 requirements specification through development and evaluation to a fully implemented AERA-2 capability. This activity will identify areas of risk in the design and development process and the steps that will be taken to minimize these risks. This will include identification of all necessary testing, from early prototyping through final operational procedure shakedown. The FAA shares the GAO's belief that testing to support the AERA-2 program is of critical importance. The FAA plans to address AERA-2 testing with a comprehensive test approach.

Discussion of Concern 2

The FAA has been involved in AERA research for well over 10 years. That research and all of the associated experimentation, coupled with extensive involvement during the last two years by a designated team of air traffic controllers charged with injecting operational suitability factors into the requirements, has led to the current AERA-1 requirements in the AAS specification. This specification is not only supported by the backing of the above research and user involvement, but also by a fairly complete set of algorithms and an operations concept that lays out, in detail, AERA-1 controller tasks.

The GAO is correct in its observations that, as in any other new system prior to commissioning, a number of detailed questions about actual operational implementation remain. These questions can only be answered after the AERA-1 software has been built and integrated into the AAS (including especially the new sector suites). A separate AAS will be installed at the FAA Technical Center when AAS leaves the factory to perform all of the AERA-1 tests necessary prior to commissioning.

In the earlier program planning for AERA, a testbed at the FAA Technical Center was intended to be used for AERA-1 operational procedure tests. However, the judgment of experienced air traffic control specialists was that this early version of the testbed, without the new sector suites and AAS software, was not adequate for determining the operational procedures for AERA-1. Thus, the plan was changed and these procedures will now be developed in the AAS discussed above well in advance of the field implementation of AERA-1.

The FAA will proceed with its plan to add AERA-2 development, evaluation, and implementation as an additional task in the AAS Acquisition Phase contract to be performed in parallel with the primary AAS development/implementation program. As discussed previously, the FAA has learned enough in its research efforts during the past several years to be confident of the feasibility of AERA-2. Again, this research and the AERA controller team have provided us with the knowledge to write a functional specification for AERA-2.

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We are currently doing the planning necessary to prepare the Statement of Work for the acquisition phase contract. This planning activity will identify all the experimentation and test and evaluation of AERA-2 functions, parameter setting, and man-machine interface that are necessary between now and final AERA-2 implementation to ensure that an operationally suitable system (which achieves the projected benefits) becomes a reality. Operational procedure testing will be performed at the appropriate time in the AAS Research and Development System at the FAA Technical Center.

GAO Concern 3 - Controller productivity projections raise questions about FAA's justification for its acquisition strategy. In particular, the GAO estimates that a 2-year delay for a four-step A-109 would lose only $100 million in benefits.

FAA Response to Concern 3 - The FAA disagrees with this finding. The GAO suggests that a deferral of the AAS Program by 2 years would result only in the loss of controller productivity benefits. Even with only a 2-year delay, $1.4 billion in user benefits would also be lost. The deferral of the AAS Program for full prototype testing prior to a production decision will:

- lead to a delay of 40 months rather than the 2 years cited by GAO;
- cause the loss of $975 million in FAA productivity benefits expected to accrue from the new sector suites.
- cause the loss of $2.85 billion in benefits expected to accrue to the user community through the AAS and AERA Programs.
- add at least $300 million to the cost of the current AAS Program.

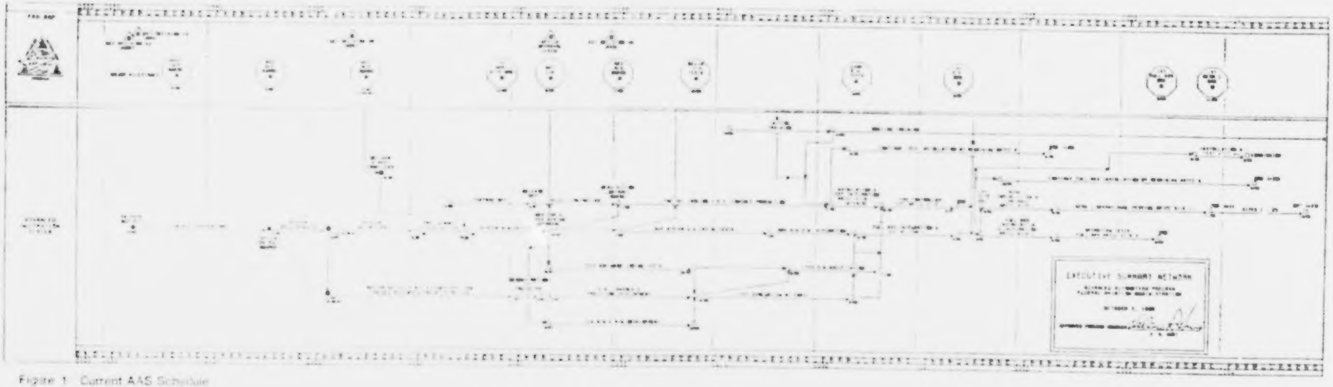
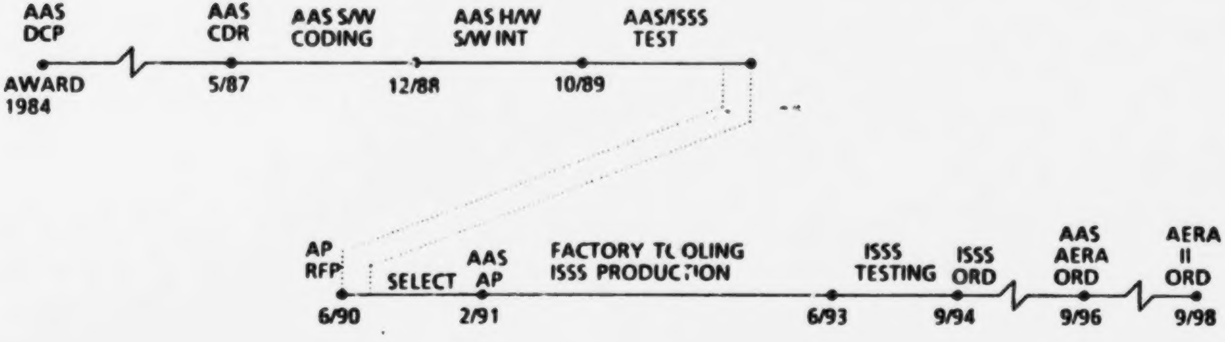

EXECUTIVE SUMMARY NETWORK

Figure 1 Current AAS Schedule


AAS
DCP
AWARD
1984
AAS
CDR
5/87
AAS S/W
CODING
12/88
AAS H/W
S/W INT
10/89
AAS/ISSS
TEST
AP
RFP
6/90
SELECT
AAS
AP
2/91
FACTORY TOOLING
ISSS PRODUCTION
6/93
ISSS
TESTING
ISSS
ORD
9/94
AAS
AERA
ORD
9/96
AERA
II
ORD
9/98

Schedule for AAS Acquisition with Design Competition Thru AAS Prototype Demos.

FIGURE 2

Mr. **Brown**. I would like to recognize, Mr. Nelson for about 5 minutes before you have to leave, Admiral.

Mr. **Nelson**. Good morning.

You are saying that the slippage in the outyears, until the plan is put into effect, is what year.

Admiral **Engen**. The initial plan was 1992-93 timeframe. It was a 10-year plan. And what we are dealing with, Congressman Nelson, is slipping the completion of that plan 1993-1994-1995.

Mr. **Nelson**. How does the automation—how will that impact the necessity to maintain a certain level of air traffic controllers?

Admiral **Engen**. I don't think it has any bearing on the level of air traffic controllers. We will maintain that operation capability as we implement the NAS plan.

The NAS plan is designed to upgrade and enhance our ability to control traffic, to improve by a factor of four, the quality that we can handle. As we implement it, we have a system and you can't turn the switch from on to off while you implement. You must implement while continuing to operate 24-hours a day, 365-days a year. We will do that with the numbers of air traffic controllers that we have on board, and that Secretary Dole has requested authority for in the fiscal year 1986-87.

Mr. **Nelson**. Which part of the software is it that you will implement first; and in what year will that occur?

Admiral **Engen**. We have a lot of software going right now.

Are you talking about the advanced automation system, I believe.

Do we have a timeframe on that?

Mr. **Frisbie**. Yes, sir.

But first, Mr. Nelson, I think we probably have to get our terminology straight. There is a new machine that is going into the field now, the Host computer, which is really the first stage of this evolution.

That machine will use the software which is presently run on the 9020 computer, the old computer, if you will. It is being rehosted in this new machine, and that process is upon us now.

We are in the process of implementing that now. The next phase is to introduce the sector suite, which is the controller workstation, which comes—when, Val?

Mr. **Hunt**. 1991.

Mr. **Frisbie**. In 1991. We put in a new work station for the controllers. The controllers develop confidence and familiarity with that work station. And then, and only then, do we roll in a new set of software, the full AAS software. So we go through these timed stages such that the system can stabilize and we understand fully what we have got before we go to the next step.

Mr. **Nelson**. Give me your impression of the potential burnout of presently air traffic controllers.

Admiral **Engen**. Burnout is a very hard-to-define thing. It is a psychological term, and something that we deal with. Air traffic control is indeed stressful, as you know, Congressman Nelson.

Burnout, I am sure that chairman, you and I have burn out levels as well under stress. What we fight in the air traffic system is to not leave people on the boards, at the scope, long enough that they become stale.

We modify their daily work day. We add additional people to the sectors if they become overloaded.

We find that there are probably one, two or maybe three times in any given day when it becomes very stressful, and those are periods that we watch very carefully. They are morning, there could be a noon push at one particular hub, or could be an evening rush, we march with this.

I don't see air traffic controllers burning out as such. When we take attitude surveys, as the GAO has, and I have in the past, and I will again this year, we find that people in some areas of the en route system are still being burdened by overtime, and this is what we are dealing with on a very real-time, and I think this is probably the area in which you are most interested.

The rest of the system out there is operating like a well-oiled machine. Let me assure you that centers such as Houston, Denver, Seattle, Kansas City, are functioning very well.

The people who are under pressure are the people at New York, Chicago, Washington, perhaps Atlanta. There are about six en route centers, this is an area where we are adding people to prevent the burnout that you are talking about. This is where we are putting all of our emphasis.

To finish this, I wouldn't want to say to you that we use up controllers and burn them out, and then we cast them aside. We just don't do that. The name of the game is to manage the system on a minute-by-minute, hour-by-hour, basis.

Mr. **Nelson**. Do you feel secure in the total number of controllers that you have now, in which you are requesting for fiscal year 1987?

Admiral **Engen**. Yes, sir; I do. Secretary Dole has approved the addition of almost 1,000 controllers to the work force. We will end fiscal year 1987 about 14,980—that is pretty close to 15,000—we are going to get there.

It will take some time to train those people. It takes us 2 to 3 years to bring somebody on and get them trained.

Our problem in the short term is be sure that our developmental controllers continue through the pipeline and that we are creating fully performance level qualified controllers.

Mr. **Brown**. Mr. Nelson, we promised Mr. Engen that he could leave at 11, and Mr. Frisbie will carry on.

Mr. **Nelson**. OK. Well, I will just say as he departs that from time to time I talk to some of the executives of airlines and I always ask the question, do you think the FAA is doing its job?

And unanimously I always get, there is never a question, they always think that you are doing the job. So I congratulate you.

Admiral **Engen**. Thank you, sir, I would like to say it is a real team; it really is. And I have never been so proud to have a job in all my life, as to work with these fine gentlemen and the entire force. We do many diverse things out there. It is an operating outfit that works around the clock throughout the year. It is pleasure to be here.

I do appreciate your consideration, Mr. Chairman.

Mr. **Brown**. Thank you very much, Admiral Engen.

Will Mr. Frisbie take charge of the crew here?

Admiral **Engen**. He will take charge, and he is going to answer every question.

Mr. **Brown**. We hope that he will. We appreciate your being here. If we have further questions in writing for you personally; we will submit them to you.

Admiral **Engen**. I will be immediately available.

Thank you, sir.

Mr. **Brown**. Mr. Frisbie, you may continue with the more detailed analysis that you have prepared here.

Mr. **Frisbie**. Mr. Chairman, we have a series of briefings for you. I think the committee has to indicate as we go along, your level of interest. If you would like us to speed up, we can do that, or stop at some point.

Mr. **Brown**. I will ask my colleagues to keep that in mind. I am so ill informed that all of it is interesting to me.

Mr. **Frisbie**. This first briefing, Mr. Chairman, is kind of an overview or introduction to the NAS plan and related R&D funding.

By way of background, the plan was first published in 1981, before the trust fund legislation was enacted.

[Chart presentation.]

In 1983 the second NAS plan matched the 5-year authorization levels of the trust fund legislation, in the totals and the profiles, leading to an $11.7 billion total for the F&E portion of the plan.

In 1984 and 1985 we put out plans matched to the appropriated levels, plus the balance of the unused authorization. The current trust fund legislation ends with fiscal year 1987.

By way of benefits, you see that the NAS plan benefits which have been primarily asserted, and which were reviewed by the Congressional Budget Office, are based primarily on productivity increases within the FAA. That is to say, we have asserted that this plan has a positive cost benefit based only on the savings to FAA, in maintenance labor costs, air traffic control cost, and in other costs such as rents, communications, and utilities, increased productivity, if you will, out of the FAA work force.

There are other benefits which are also very substantial and those are in the user category. Those benefits remain real. The benefits associated with FAA operations, have reduced somewhat since we first published a plan. That is based primarily on the fact that the forecasted increase in traffic has not materialized, and since many of these benefits are tied to productivity, if the traffic goes down, then it has the effect of the economies of reducing the benefits. But we still think that there is a very positive cost/benefit.

Mr. **Brown**. Mr. Frisbie, before you leave that chart, are you going to quantify the dollar savings or value of the safety factor under that user operations category?

Mr. **Frisbie**. I don't think that we have broken it down into dollars for safety, but we do have an overall dollar figure that we have associated with that. And since the users tend to want to debate those issues, we have stuck primarily on saying that it is cost beneficial in the FAA operating category, and that there are substantial benefits.

But, yes, sir, we do have a figure for that, and I can supply that to you for the record.

Mr. **Brown**. All right, please do.

Go ahead.

[The information follows:]

The completion of the National Airspace System Plan will bring about efficiencies and productivity gains which will offset increasing demand on the System from air traffic growth. The offsetting effects will allow the FAA to operate the system at or below the 1980 cost levels through the year 2000, when adjusted for inflation. Further, when measured against 1980 air traffic control productivity and the rising maintenance cost of aging equipment, this cost containment is shown to have a significant return on investment to the FAA. It is projected that over the typical 20-year life of ACT equipment, the total value of these savings to the FAA will amount to $31.2 billion. Users of the National Airspace System will benefit from the NAS Plan through improvements in Flight Services, more efficient routing, reduced delays, and even greater safety. Savings to users is estimated to be $46.0 billion

Mr. **Frisbie**. This is a status of the committed NAS plan programs. There are 90 programs or projects within at the $11.7 billion level. Twenty-eight of those projects don't have any major equipment acquisition associated with them, they account for $2.5 billion. Sixty-two of those programs have major equipment acquisition, and account for $9.2 billion.

Forty-two of those projects, the contracts were awarded in fiscal year 1985 and before, committing $7.1 billion of funds. Nine programs the contracts are to be awarded this fiscal year and they will commit another $800 million. Eleven programs will be awarded after fiscal year 1986, which will commit the balance.

Another way to look at that is that 68 percent of the major projects were under contract by the end of fiscal year 1985. And 82 percent will be under contract by the end of fiscal year 1986.

When I talk about this commitment I need to stop and tell you that we are using that term in a way which perhaps would disturb an economist, because in this sense we are talking about having established a contractual path which will lead us to completion. So in the case of the advanced automation system, where we have two contractors and a design competition phase, we are saying we are committed to that program because the logical and planned progress would be to down select to a single contractor and go on.

Then in that sense 78 percent of the dollars are committed by the end fiscal year 1985; and 87 percent committed by the end fiscal year 1986.

This chart is kind of a recitation of the history, and you will see—can you focus that just a little bit—what we tried to array here are three scenarios, if you will.

On the left-hand column what was envisioned in the legislation for F&E.

In the middle column the annual appropriations which have been lowered, and in the case of 1987 it is our request to the Congress.

In the third column is that which we had originally planned when we published our last NAS plan.

Finally, we have indicated what we expect as an outyear allowance.

I think you will see that the point that the Admiral was making earlier in that we haven't sought or received the appropriations that were originally envisioned under the trust fund legislation. In terms of the outyears we have to expect a lower level than we were even planning on at the time we put the 1985 plan.

R&D situation arrayed much the same. The legislation envisioned, for example, $193 million in 1987, we are requesting $134.5 million. In the outyears we are expecting that we would be operating at $127 million level.

As far as the specific impact of Gramm-Rudman on the F&E portion of the plan, we have taken three projects, as we have talked about, off full funding to minimize that impact. As the admiral indicated we are anxious to get back onto full funding, and hope to do that in fiscal year 1988.

We are working within the Office of the Secretary and OMB on the post fiscal year 1987 legislation, which will provide the funding necessary to complete the plan. The exact profile and dollar levels are not decided and the decisions that are taken will clearly give us the direction that we have to take as far as the outyears are concerned.

We have not published our NAS plan this year. Typically we would have it before you at this time, but we have delayed it until later in the year. It is required to be delivered to the Congress before the start of next fiscal year, we have delayed it so that we can synchronize it with proposed legislation which the administration will be sending up very shortly.

The full funding story is that we have selectively taken $43.4 million of 1987 projects off full funding and are plowing that back, if you will, into other projects so that we can keep the NAS essentially on schedule.

These are the major procurements planned in fiscal year 1986; the admiral mentioned some of them: The airport surface detection; the final increment of 13 systems; the airport surveillance radar, the short-range radar the increment to buy 26 additional systems; the microwave landing system-the final increment of 60 systems on the initial contract of 172; New York TRACON, that is the terminal automation in New York, we let a contract to upgrade the processing and display equipment at that terminal; the integrated communications switching system, which is a switching system for the towers and the flight service stations; the radio control equipment, which is for remote communications facilities.

In fiscal year 1987 we have listed some of the major components of the NAS plan. We expect the Nexrad to be awarded, which is a joint procurement in conjunction with the Department of Commerce, Department of Defense, to detect hazardous weather en route. That production contract is to be awarded.

The terminal Doppler weather radar for detection of wind shear in terminal areas using a Nexrad derivative. What we have envisioned, and we will talk about later, is piggy-backing on that en route contract to get us some devices that will give us near-term service in the terminal area.

Loran-C, which is a hyperbolic navigation system. We have transmitters which we plan to install to close what is called the "mid-continent gap." There is very good coverage provided on our coasts, and the lower Mississippi Valley. We will put in some transmitters in conjunction with the Coast Guard to close the "mid-continent gap" so that the entire country is covered with good Loran-C signals. We hope to initiate the second buy of MLS in fiscal year 1987.

Some of the programs for which part of the funding was deferred, the admiral mentioned some of these. They include: the radar microwave link replacement and expansion; some money for communication facilities consolidation; some money for remote maintenance monitoring, part of the National Radio Communications System; some test equipment and aircraft avionics.

And if I might say, Mr. Chairman, what we have tried to do is to do this prudently, such that we are using the flexibility that is included in our contracts, and by taking up slack, that is available to us, to try to take those cuts in a way that has the minimum impact.

These are the major programs that are in the fiscal year 1987 request. You can see those, the Voice Switching and Control System is a major piece for almost $34 million; aviation security, for almost $13 million; and the AERA program for almost $12 million; and at the bottom the Advanced Automation Program for about $23 million. And those account for about 67 or 68 percent of that total.

These are some of the things that we are not doing in fiscal year 1987. These are for the most part advanced technology things which we feel that we can safely defer in the short term.

Then finally, for my portion of this, Mr. Chairman, we think that we have taken those management actions to soften the impact of the budget restraints. That indeed, some of our R&D initiatives have been deferred, and that the 1986 NAS plan will be synchronized with the new legislation. So hopefully, we have a stable base for outyears.

Thank you, Mr. Chairman.

Mr. **Brown**. Do you want to proceed with the next?

Mr. **Frisbie**. Yes, sir.

Mr. Pozesky will talk in more detail about the NAS plan project.

[The charts follows:]

NAS PLAN AND RELATED RE&D FUNDING

April 23, 1986

NAS PLAN FUNDING BACKGROUND

- 1981 NAS Plan Published Before Trust Fund Legislation
- 1983 NAS Plan Matched to 5-Year Authorization Levels of Trust Fund Legislation Totals and Profiles - $11.7 Billion F&E
- 1984/1985 Plans Matched to Appropriated Levels Plus Balance of Unused Authorization
- Current Trust Fund Legislation Ends With FY 1987

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NAS Plan Benefit Categories

- FAA Field Operations
  - Maintenance Labor Costs
  - ATC Labor Costs
  - Other Costs

Increased Productivity

- User Operations
  - Safety
  - Capacity (Decreased Delays)
  - Efficiency

Status of Committed NAS Plan Programs

- 90 Programs -- Total Plan = \$11.7B
  - 28 Programs -- No Major Equipment Acquisition = \$2.5B
  - 62 Programs -- Major Equipment Acquisitions = \$9.2B
- 42 Programs -- Contracts Awarded FY 1985 and Prior
  - Committed Funds = \$7.1B
- 9 Programs -- Contracts to Be Awarded This FY (FY 1986)
  - Will Commit \$0.8B
- 11 Programs -- Award After FY 1986
  - Will Commit \$1.1B

NAS Plan Overview
Contract Status

68% or 42 of 62	Major Projects Were Under Contract by the End of FY 1985
82% or 51 of 62	Major Projects Will Be Under Contract by the End of FY 1986

NAS Plan Overview Financial Status

78% of $9.2B[1] Committed by End of FY 1985

87% of $9.2B[1] Committed by End of FY 1986

Based Upon Contractual Obligations and the Commitment of the Resources Required to Bring the Equipment or Systems to Commissioning. Also Allows for Ongoing Design Competitions to Proceed as Planned Into Production and to Commissioning.

[1] Does Not Include $2.5B of Annual Recurring (Regional Managed Routine) Programs Subject to Congressional Approval and Appropriations of Authorized Levels.

F&E Multiyear Planning Status
($ in Millions)

Fiscal Year	Airport & Airway Improvement Act of 1982 Authorized Legislation	Annual Appropriation	4/85 NAS Plan FAA/OST	Expected Outyear Allowance
1982	261	261	261	
1983	725	625	625	
1984	1,393	750	750	
1985	1,407	1,358	1,360	
1986	1,377	950[1]	1,147[2]	
1987	1,164	825[3]	1,430	825
1988			1,430	1,164
1989			1,430	1,164
1990			1,430	1,164
1991			923	1,164
1992			923	(1,164)
	6,327	4,769	11,709	

[1] Appropriation of 993.0 – Less $43M Gramm-Rudman

[2] FY 1986 Request to Congress

[3] FY 1987 Request to Congress

R,E&D Multiyear Planning Status
($ in Millions)

Fiscal Year	Airport & Airway Improvement Act of 1982 Authorized Legislation	Annual Appropriation	Expected Outyear Allowance
1982	72	72.0[1]	
1983	134	103.0[1]	
1984	286	263.5	
1985	269	265.0	
1986	215	205.0	
1987	193	134.5[3]	
1988			127
1989			127
1990			127
1991			127
1992			(127)
	1,169	1,043.0	

[1] Does Not Include FED Appropriated in FY 1982 of $8.0M, and FY 1983 of $14.8M

[2] Appropriation of $205 Million Less $8.2M Gramm-Rudman

[3] FY 1987 Request to Congress

Note: NAS Plan Projects Have R&D Funding in Design Phase.

Impact of Gramm-Rudman

1986 NAS Plan

- Three Projects Off "Full Funding" to Minimize Impact of Gramm–Rudman for the Fiscal Year 1987
- Working With OST/OMB on Post FY 1987 Legislation to Provide Funding to Complete Plan
- Publication Date Delayed Until September

Full Funding
Current FY 1987 Plan

- Selectively Take $43.4 Million of FY 1987 Projects Off Full Funding
- Will Use $43.4 Million and Other Degrees of Freedom to Keep the NAS Plan Projects Essentially on Schedule

Major F&E Procurements Planned in FY 1986

- ASDE-3 -- Final Increment of 13 Systems
- ASR-9 -- Incremental Buy of 26 Systems
- MLS -- Final Increment of 60 Systems on Initial Contract
- New York TRACON -- New Contract to Upgrade Processing and Display Equipment
- ICSS -- Additional Communications Switching Systems for Air Traffic Control Towers
- RCE -- New Contract for Signal/Tone Control Equipment for Remote Communications Facilities

Procurement of the Following Major Components of the NAS Plan Is Planned to Be Awarded in FY 1987

1. Next Generation Weather Radar (NEXRAD) in Conjunction With the Department of Commerce and the Department of Defense for Detection of Hazardous Weather in the En Route Environment.
2. Terminal Doppler Weather Radar for Detection of Wind Shear in Terminal Areas Using NEXRAD Derivatives.
3. Loran-C Transmitters to Complete the Mid-Continent Signal Coverage Gap.
4. MLS Second Buy of 700 Systems Will Be Awarded (500 for FAA and 200 for DOD).

No Major Components of the NAS Plan Will Be Delayed for Budgetary Reasons in FY 1987.

F&E PROGRAMS FOR WHICH PART OF FUNDING DEFERRED

- RML Replacement and Expansion
- Communication Facilities Consolidation
- Remote Maintenance Monitoring
- National Radio Communications System
- Test Equipment
- Aircraft Avionics

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Major FY 1987 R,E&D Programs

• Separation Standards (Includes FL-290)	$ 3.0M
• Advanced Traffic Management	1.9
• Automated En Route ATC	11.8
• TCAS (TCAS II/III and LIP)	4.3
• Voice Switching and Control System Development	33.9
• Terminal Weather Radar	2.3
• NEXRAD	2.2
• Aircraft Safety (Excluding Aviation Security)	9.7
• Aviation Security	12.7
• Aviation Medicine	3.8
• Environment (Aircraft Noise/Pollution)	1.6
• Advanced Automation Program (Host $1.4M AAS $21.5M)	22.9

Note: Four Programs: VSCS (25%), Aircraft Safety (16.6%), AERA (8.7%), and AAS Programs (17%) Account for 67.7% of the $134.5M FY 1987 Program.

R,E&D PROGRAMS DEFERRED FROM ORIGINAL FY 1987 PLAN

- Airport Surface Surveillance -- Runway Intrusion and Automation Aids
- Data Link Applications Development
- Oceanic Automated Dependent Surveillance
- Sensor for Parallel Runway Monitors
- Terminal ATC Automation
- Technology Developments in
    - AI for Air Traffic Applications
- Advanced ATC Development Lab at FAA Tech Center

Summary

- Management Actions Have Softened Impact of Budget Cuts in FY 1986 and FY 1987
- Some RE&D Initiatives Deferred From FY 1987 Plan
- 1986 NAS Plan Publication Delayed Until Approximately September

Mr. **Pozesky** [chart presentation]. I have three general areas to cover in the next briefing. One is we would like to talk about the NAS plan itself. The second area is we would like to talk about our major system support contractor, our major system contractor with the NAS plan, Martin Marietta, and the progress on that. And then give you some sort of an insight into the status of several of our major projects and programs.

Most of all it has historically been our practice to produce the NAS plan in time for these hearings. Because of the fact that we are anticipating new outyears, new legislation for the reauthorization, and the fact that we believe that we have a policy internally to make the NAS plan track and be a realisitic plan, track the actual program progress, we have elected to defer the actual publishing of the next version of the NAS plan until the next 5-year authorization has been forwarded by the administration. In any event we will have that plan up to you by September, which we are required to do by law.

In terms of a little insight into the future, we intend to use—the next plan will have the same format as today's NAS plan. The major change you will see in it is the inclusion of a new terminal Doppler weather radar system at major airports, to deal with the major weather problem of wind sheer. And the inclusion of multicolor displays, for both the advanced automation system and the flight service automation systems.

There are some additional new requirements in this plan. As we have already talked about the terminal Doppler weather radar. There is one requirement which we would just like to point out and that is the inclusion of two sensors for the dedicated use of closely spaced parallels.

The notion here is that by the inclusion of a more accurate radar at selected airports, mainly Minneapolis, and Kennedy in this configuration, we can actually operate independent parallel approaches and obtain a significance increase in airport capacity. We are proposing to try that and to do that in the NAS plan. That will be a completely new addition to the NAS plan which has not been there previously.

Mr. **Lewis**. May I ask you a question?

Didn't Mr. Frisbie just say that that was one of the areas that was deleted in the next to the last slide?

Mr. **Frisbie**. I think what Mr. Pozesky is talking about isn't in the F&E plan. What we are working on were more sophisticated devices to serve this same function and the R&D for those more sophisticated devices that been deferred.

Mr. **Lewis**. This is not deferred?

Mr. **Pozesky**. This is not deferred, Mr. Lewis, this is a radar which we will purchase and install at an airport and allow the controllers to independently——

Mr. **Lewis**. Sensor, it wasn't radar?

Mr. **Frisbie**. We were talking about the use of trilateration devices, Mr. Lewis.

Mr. **Pozesky**. Another portion of this plan is we have begun to include in the plan a chapter on outyear requirements, future requirements that are really beyond the time period of the NAS plan formally beyond that time period. And we will see that as we get further and further to the 1992 and 1991 timeframe, as the NAS plan draws down, the contents of that outyear chapter will increase and in this we anticipate that it will already call for the replacement of some our old radars, a new replacement of some of our old beacon systems, and the replacement of long-range radars.

Using the 1985 NAS plan as a base, and reiterating many of the accomplishments of the plan, we really do believe that we have generated a great deal of momentum and have really moved the projects and the programs quite aggressively in response to the President's and the Congress' commitment. We have actually completed six projects in the NAS plan in 1985, and they are listed here.

We have achieved last year in 1985, anticipate that we will have achieved a variety of new contracts awarded. I will just mention a few of them. There is a long list.

We have already talked, and Mr. Hunt will talk later about the Host computers, the new computers for automation systems. We have awarded and ordered from Norden Systems an airport surface detection radar, for airport surface reasons.

We have implemented our flight service automation system and just completed the implementation of Model 1. All the construction for the expansion of our en route centers is currently underway. In fact, in Seattle that construction has been completed.

We have begun the implementation of additional low-level weather sensors. We have a major thrust to upgrade and modernize our maintenance capabilities, something that we don't often talk about but a large portion of our thrust in the NAS plan is to bring new automation capabilities to the maintenance and overseeing of the current set of equipment in the air traffic control system.

We expect that we will be on the way with some improvements in the maintenance control center. And we are working on many of our advanced automation capabilities called AERA 1.

You will hear us talk about AERA 1, 2, and 3, as part of our advanced automation capabilities.

Mr. LEWIS. Mr. Pozesky?

Mr. POZESKY. Yes, Mr. Lewis.

Mr. LEWIS. On the LLWAS, low-level 1 system, will you go back to that again?

Mr. POZESKY. Yes, sir.

Mr. LEWIS. Can you let us know where you have been installing those.

Mr. POZESKY. Yes, sir, the ultimate objective is 110 airports. I think we have got about 84 of them installed right now. We can give you a complete list for the record.

Mr. LEWIS. Thank you.

[The information follows:]

AIRPORT LOCATIONS OF LOW LEVEL WIND SHEAR ALERT SYSTEM (LLWAS) LOCATIONS (As of June 4,1986)

The following LLWAS's are installed and operational (84 Units):

Albuquerque, NM
Atlanta, GA
Baltimore, MD
Birmingham, AL
Boston, MA
Buffalo, NY
Charlotte, NC
Chicago (O'Hare), IL
Cincinnati, OH
Cleveland (Hopkins), OH
Columbus, OH
Dallas/Ft. Worth, TX
Dayton, OH
Denver CO
Des Moines, IA
Detroit (Metro.), MI
Ft. Lauderdale (Int.), FL
Houston (Int.), TX
Houston, TX
Norfolk, VA
San Francisco, CA
Huntsville, AL
El Paso, TX
Billings, MT
Cedar Rapids, IA
Greer, SC
Rochester, MN
Toledo, OH
Indianapolis (Int.), IN
Jackson, MS
Jacksonville, FL
Kansas City (Int.), MO
Knoxville, TN
Las Vegas, NV
Little Rock, AR
Los Angeles, CA
Louisville, KY
Memphis (Int.), TN
Miami, FL
Milwaukee, WI
Minneapolis (Int.) MN
Mobile, AL
Nashville, TN
New Orleans, LA
New York (Kennedy), NY
New York (LaGuardia), NY
Newark (Int.), NJ
Wichita, KS
Honolulu (OAHU), HI
Shreveport, LA
Greensboro, NC
Grand Rapids, MI
Peoria, IL
Green Bay, WI
Lansing, MI
Midland, TX
Oklahoma City, OK
Omaha, NE
Orlando (Int.) FL
Philadelphia (Int.),PA
Phoenix, AZ
Pittsburgh (Int.), PA
Raleigh-Durham, NC
Roanoke, VA
Rochester, NY
St. Louis (Int.), MO
Salt Lake City, UT
San Antonio, TX
San Juan, PR
Sarasota, FL
Tampa, FL
Tulsa, OK
Washington (Dulles),VA
Washington (National), VA
W. Palm Beach, FL
Tucson, AZ
Baton Rouge, LA
Dallas (Love Field), TX
Madison, WI
Tallahassee, FL
Sioux Falls, SD
Colorado Springs, CO
Windsor Locks, CT
Lubbock, TX

The following LLWAS's are programmed for installation (26 Units):

Columbia, SC
Montgomery, AL
Augusta, GA
Daytona Beach, FL
Fayetteville, NC
Moline, IL
Savannah, GA
Springfield (Capitol), IL
Columbus, GA
Asheville, NC
Charleston, SC
Pensacola, FL
Chattanooga, TN
Austin, TX
Bristol, TN
Ft. Myers, FL
Lexington, KY
Ft. Smith, AR
Syracuse, NY
Richmond, VA
Springfield, MO
Albany, NY
Sioux City, IA
Lincoln, NE
Charleston, WV
Monroe, LA

Total LLWAS installations - 110

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Mr. **Pozesky**. To summarize, we believe that significant progress has been made in the NAS plan. Last year the FAA awarded four times—I guess, three times more contracts than it ever had awarded in our past. Last year, fiscal year 1985, will turn out to be the peak year for obligation in the NAS plan.

We have, as I indicated earlier, we are planning to withhold publication of the 1986 version of the plan until the outyear projections and the administration submits legislation for the new authorization in fiscal years 1988 and beyond. We will synchronize the NAS plan with that legislation.

We are mindful of the fact that we do have a requirement to submit that plan to the Congress by September of this year. We fully expect to make that commitment.

I would like to now change subjects and talk about a second element, a key ingredient to our implementation of the NAS plan, that is something called our system engineering and integration contract.

As you may recall one of the tenets of proceeding with the implementation of the NAS plan was to capitalize on the capability available in industry in helping us guide this program. We have hired Martin Marietta Corp. as our system's engineering and integration contractor. They provide for us two very fundamental support functions.

One is they share with us in mission accountability on the progress of the this plan, and they do provide the necessary engineering support and engineering analysis at the project and program level to support our engineering design.

I would like to talk about that contract now. That contract was awarded, as it shows here, in 1984, to Martin Marietta. It is a mechanically cost, plus and award fee, that is the fee that Martin Marietta is granted is determined unilaterally by the FAA every 6 months, and it is based upon our assessment of their performance in support of the NAS plan over that 6-month period.

Mr. **Lewis**. Does that fee, is it defined in some way as to what the limits are——

Mr. **Pozesky**. Yes, sir.

Mr. **Lewis** [continuing]. And what the criteria are?

Mr. **Pozesky**. Yes, sir. There are both limits and criteria established in the contract.

The point is that the FAA really measures that unilaterally and they, Martin Marietta themselves plays no direct role in determining where between those two limits they are awarded a fee. Historically they have been getting about 80 percent of the available fee awards over the past award fee periods.

This is the major area of work. As I say the two primary ones for us are top level NAS program management support; translation of that really is mission accountability, jointly with us at the management level, in seeking the achievement of the objectives.

And the second area being the the systems engineering design for the total of the NAS plan. And let me just talk about the third area which is equally important is the project-by-project engineering support which assists us in the accomplishments of each of the 80 or so projects associated with the NAS plan.

The contract was and is a 10-year contract. Five years with two options which could take us up to a total of 10. It was awarded for a total of $684.1 million throughout that 10-year period.

We have added modifications that add approximately $100 million to that total. Through 1987 we have expended about $275 million. We are processing additional modifications to that program to broaden their support in each of the NAS plan projects, and to provide greater support in the NAS, and to begin the transition of some of that support into the regional areas. I will talk more about that later.

The SEI contractor is headquartered adjacent to the FAA building about 3 blocks away from us. They occupy two large buildings. They have established offices at each of FAA's nine regions and the FAA technical center. And they have implemented a nationwide computer link which links all of these systems together for scheduling, staffing, et cetera.

Currently their staffing is on target. We did, because of budget restraints, ask that they withhold further increasing their staffing. As you can see there are approximately 1,000 people on board in this contract, both directly from Martin Marietta and their major subcontractors in September of this year.

On the top-level area we have really succeeded and achieved a great deal of progress in terms of internal management and processes and schedule control, configuration management control, of the NAS plan. We have a master schedule baselined, and every month we literally produce an inch-and-a-half-thick document with each of the milestones of the major projects' status and updated.

We have updated and baselined the fiscal programs. We have implemented a data base, which contains in total life schedule of each of the projects from the system level all the way down to the site-by-site implementation plans.

We have, and are trying to put in place internally within the FAA and throughout our contractors in our regions, a very, very formal structured process for change control to make sure that across the country we are doing this in an integrated comprehensive way. That is occupying a lot of our attention and we are achieving quite a bit on that objective.

At the system level we have completed the baselined system design. We have completed many of the system documents necessary to provide an overall system framework for the entirety of the NAS plan. And we will have completed what is called our master transition plan on how we are going to transition all of these systems to the field in September of this year.

One element of this Martin Marietta contract, this SEI contract, which is probably going to be increasing with time is the transition of this equipment from design into the field. Even though the NAS plan is fairly new to many of us, the reality is that much of this equipment is now beginning to be delivered. We already have, as I say, all the centers under construction. We will be getting delivery of the main Host computer this month—I am sorry—this fiscal year.

We have already taken delivery of the flight service station automation equipment. Many of these new equipments are going to be delivered beginning this year. So you are going to see a transition of much of the attention of this contract to the regional capabilities.

We are emphasizing the implementation plans, and the regional plans for the implementation of the Martin Marietta Program.

There is an element of this transition to the field—the next chart readout—which I know this committee has been interested in, and that is the FAA has been entertaining the notion of hiring, yet, another contractor to assist us in the implementation of the massive amount of equipment heading toward the field, over 22,000 pieces of equipment.

There has been some concern on the part of the committee staff at least, on the relationship between Martin Marietta on this new contract which we call the technical support services contract.

Let me just say that from our perspective, that concern is valid. That concern is justified. We are busily structuring the TSSC contract that so that there is no misunderstanding of roles and missions. Martin Marietta will have the overall—with us—we will still have the system role, and the system integration role, and this new contractor, which will really represent arms and legs, to assist the FAA in the implementation of this system, will be just that, will be responsive to our direction.

We have a lot of activity in the implementation area, and much, much of the thrust of the implementation and the development of the NAS plan will now be moving toward our regions over the next year or two.

In summary, on the Martin Marietta, the SEI contractor, it has been a new way of doing business for us in the FAA. There has been some growing pains, both for us in the FAA, and for the company, Martin Marietta to get used to the FAA's way of doing business. We believe we are over that.

We believe we have a good management team now. We have operating management controls in process. And we have significant accomplishments to report on both the system level, the management level, and the project level.

The last area I would like to talk about is to just run down four, five or six of our major projects, and give you a kind of status of where we are. We have picked the major ones. There are 80 or 90 total programs, so we hope we have kind of focused on the right 7 or 8.

The first one we would like to talk about is our terminal radar program, we call it ASR-9. It is the new terminal radar for air traffic control at airports across the country.

We are under contract to Westinghouse to provide, to purchase 96 of these systems. It is multiyear contract which was awarded in 1983. The design progress has been quite satisfactory. This contract is about a $480 million contract to Westinghouse.

We are expecting the first operational system this year, in fiscal 1987. The equipment in fiscal 1986 will undergo acceptance testing. We are targeting the first operation delivery in 1987. And we will, from that point on, you start seeing these radar show up across the country at most of our new facilities, or at most of our major terminal areas. That program is very much on track.

A key ingredient to many of the automation improvements and many of the upgraded capabilities we are projecting for the air traffic control system is what we call mode-S/data link system. This is a new air traffic control surveillance system.

We are going to use it in our automated system to not only determine where the aircraft are but to get their altitude and identity, and also so that we can exchange computer information between ground computers and airborne system through this data link. This program has been historically of great interest to this committee. It is now under production contract to a joint venture of Westinghouse, and SDC. This is about a $250 million program. The design is underway; and as you can see the projected dates of this program. First delivery in fiscal year 1987, for testing; fiscal year 1988, first production delivery; and fiscal year 1992, last production delivery.

We have had a few internal technical problems. We have slipped the internal technical review of this program four or five months. We think that will result a ultimate—we think we can recapture that, and result in perhaps, a 2- or 3-month slip at the back end of this program.

But we don't see any significant technical problems with this. It is just a question of cranking through the software and this program is also very much underway.

One of our bigger programs is the long-range radar program. This is a program to purchase 48 radar systems for the FAA. It is a joint program with the Air Force.

The FAA in joint agreement with the Air Force actually has the responsibility for operating and maintaining the continental radars used jointly by the Air Force and the FAA. FAA uses them for airspace surveillance for air traffic control, the Air Force uses them for air defense purposes.

That program which you might sometimes refer to as a joint surveillance system, joint between us and Air Force, is up for replacement and the program is to purchase 48 new three-dimensional radars which will be jointly used by the FAA and the Air Force to replace existing, very labor intensive, outmoded technology systems. That program has contained money in earlier years, its major new start will be in fiscal year 1988.

We have a contract which we awarded to Norden Systems to refurbish our existing vacuum tube radars, that is underway. The major new start for these 48 new 3-D radars will be with our fiscal year 1988 program, and it is an integral part of the air traffic control modernization.

Cost wise we have agreed with the military on a 50/50 cost sharing of the capital investments for this new system.

An equally important element of the NAS plan is the fact that the FAA will implement its own nationwide telecommunications system. An important element of that is the inclusion of a RML or radar microwave link or radio microwave link system.

As part of the NAS plan we will be buying 1,000 microwave link repeaters and implementing them across the country to carry the telecommunications associated with air traffic control. That contract has been awarded to AT&T, was awarded in fiscal year 1985, and the deliveries are shown on this chart.

Another program of significant interest to this committee historically, has been Microwave Landing System. We have been in the business of developing the microwave landing system since the 1970's; we now have a production contract for the implementation of that system. It was awarded in fiscal year 1984 to Hazeltine Corp. Hazeltine has experienced design difficulties in achieving their objectives. We are now projecting delivery of the first system in fiscal year 1985—I am sorry, 1987—they have suffered a slip of about a year and half in this program. That slip was caused, we believe, because of internal design problems and is really not traceable to the technology problems of MLS.

MLS, or a microwave landing system has been built by many companies, and is in use in many places throughout the world. So we have simply a design software problem on our hands. We are projecting a second award, a second buy—I am sorry, Mr. Lewis?

Mr. LEWIS. What is the transition going to be from the current ILS system to the MLS system; what kind of schedules do you have worked out for that?

Mr. POZESKY. The first thing that is said is that these two systems are not electronically compatible, so you have to carry both. We expect that the transition will take at least 15 years for a complete transition in the United States; that is right.

We expect that we implement up to 1250 MLS's. We will be putting them on runways—there is quite a mix, really, but many of these MLS's will go on runways that currently have ILS's, so that we will operate both MLS's and ILS's simultaneously, at those runway ends.

Mr. LEWIS. And the MLS's will go into the major facilities first, is that correct?

Mr. POZESKY. Well, they are going into—we have what we call a network concept for implementation. We want to implement them in geographic areas though. Airlines, such as commuter airlines can equip with MLS and be sure that within their routes they can have MLS's in many of the airports that they serve.

So in some cases you will find them initially going into major hubs. In other cases you will find them initially going into smaller airports simply because of this network concept.

Mr. LEWIS. You have a general overall plan set up, I take it, in order to do this now?

Mr. POZESKY. Yes, sir; we do. We have actually issued and gotten public comment on what we call our transition plan. We went through a very formal process of going to public hearings on transition strategies for MLS.

I think that plan guarantees that we will not shut down ILS service before two-thirds of the aircraft using that runway are equipped.

Mr. LEWIS. You just answered my concern.

Mr. POZESKY. But there is a date which says that we really would like—we really do not want—we are obligated by ICAO to have MLS services on international runways by the year 2,000. We really would like to decommission those ILS's as soon as possible, because it is a maintenance burden for us.

Mr. LEWIS. Thank you.

Mr. POZESKY. Another project, which Mr. Frisbie mentioned, which is contained in our 1987 budget and was contained in our 1986 budget is to round out the Loran-C coverage in the United

States. In this case the FAA is going to transfer funds to the Coast Guard to purchase and implement Loran-C transmitting stations so that we can get full coverage throughout the United States, and close what is now the gap in coverage which occurs in the midcontinent.

That budget, the budget request for those stations is contained in our fiscal year 1987 F&E budget and the schedule is shown, given that is approved, the schedule is as shown.

Another important element of our program is the flight service automation system. This is clearly one of the controversial elements of that program. It has been something which affects the general aviation community quite a bit, and it is something which we have experienced, software delays. Our major system contractor, E-Systems out of Garland, TX, has had software difficulties in delivering this product.

I am happy to say that they have successfully delivered the first model 1 system, and it was commissioned in February of this year. We are beginning, we hope to waterfall and implement those systems nationally.

We will be submitting a report to the Congress on a follow on to the model I system which we call DUATS, which is direct user access terminal system. There has been a certain amount of controversy as to the strategy for FAA's follow on whether or not we ought to make more use of the private sector or whether we ought to produce DUATS as an integral part of the model 2 system.

We will now propose, subject to approval within the administration, that we think to make much more broader use of the available services in the private sector to achieve this purpose. This really does represent a change from our earlier approach. Again, let me say, subject to approval within the administration, we will be going in that direction.

The last project I would like to talk about is what is known as automated en route air traffic control, AERA. It is very much a development program. It is a program in which a great deal of the software, first the new automated functions which will ultimately be included in the AAS system as being produced.

It comes in three packages, AERA 1, AERA 2, and AERA 3. The first package is really an automatic prediction of conflicts based upon flight plan information.

The second package takes that flight plan conflict prediction to projection of resolution, the computer automatically searches in advance of where the aircraft is supposed to be, and if it detects conflicts it can generate and recommend to the controller alternative flight deviations.

The last package is really where we begin to automate many, many of the routine functions of the air traffic control system. The funds for this development are contained in previous year budgets and in the the fiscal year 1987 R&D budget. The major development contractor thus far for this has been the MITRE Corp.

The main dates: AERA 1 and 2 will be part of the advanced automation system implementation, with AERA 3 being the follow on software to that program.

Mr. Chairman, that is quite a bit of information. Those are the three general areas that I planned to cover.

Mr. Hunt can give us some more indepth into the advanced automation program and how that is going.

Let me pause and see if you have any questions, and if not, we go on directly to Mr. Hunt?

[The charts follow:]

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NATIONAL AIRSPACE SYSTEM (NAS) PLAN

1986 GENERAL STATUS

APRIL 23, 1986

23.2

ANTICIPATED CHANGES IN NAS PLAN PROJECTS

- CHAPTER FORMAT SAME AS 1985 PLAN
- MAJOR CHANGE IS ADDITION OF TERMINAL DOPPLER WEATHER RADAR (TDWR) AS A NEW REQUIREMENT
  - TDWR SYSTEMS AT MAJOR AIRPORTS
  - COST INCREMENT OF $550 MILLION
- A REQUIREMENT FOR COLOR DISPLAYS ANTICIPATED FOR THE ADVANCED AUTOMATION SYSTEM (AAS) AND FLIGHT SERVICE AUTOMATION SYSTEM (FSAS)

NEW REQUIREMENTS

PRE-1992

- TERMINAL DOPPLER WEATHER RADAR
- NEW SENSOR FOR MONITORING IFR PARALLEL RUNWAY APPROACHES

POST-1992

- REPLACEMENT OF OBSOLETE TERMINAL RADARS (ASR-7/8)
- AIR TRAFFIC CONTROL BEACON INTERROGATOR (ATCBI) REPLACEMENT (WITH MODE S)
- REPLACEMENT OF OBSOLETE LONG-RANGE RADARS (ARSR-1/2)

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ACCOMPLISHMENTS IN 1985

- SIX PROJECTS WERE COMPLETED IN 1985
  - AUTOMATED RADAR TERMINAL SYSTEM (ARTS) III ASSEMBLER
  - ARTS II DISPLAYS
  - INTERIM VOICE RESPONSE SYSTEM (IVRS)
  - RADAR REMOTE WEATHER DISPLAY SYSTEM (RRWDS)
  - GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE (GOES)
  - TELETYPE REPLACEMENT

- PRODUCTION CONTRACT AWARDS
  - HOST COMPUTERS
  - ARTS IIA/TPX-42 REPLACEMENT
  - AIRPORT SURFACE DETECTION EQUIPMENT (ASDE-3)
  - LONG RANGE RADAR UPGRADE
  - EN ROUTE AUTOMATIC RADAR TRACKING SYSTEM (EARTS) CONFLICT ALERT/MSAW SOFTWARE
  - PHASE III OF AIR-GROUND COMMUNICATIONS MODERNIZATION (FOR FSS)
  - ILS LOCALIZERS COMPONENTS (TUBE-TYPE REPLACEMENT)

- **OTHER SIGNIFICANT ACCOMPLISHMENTS**

  - AWARDED CONSTRUCTION CONTRACTS FOR AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC) BUILDING EXPANSIONS
  - INSTALLED FLIGHT SERVICE DATA PROCESSING SYSTEM (FSDPS/FSAS) AT FIRST FIELD FACILITIES
  - COMPLETED DELIVERIES OF SECOND GENERATION VOR AND TACAN (VORTAC)
  - COMPLETED PHASE I OF THE NATIONAL RADIO COMMUNICATIONS SYSTEM (NARACS) BACKBONE
  - BEGAN IMPLEMENTATION OF ADDITIONAL LOW-LEVEL WINDSHEAR ALERT SYSTEM (LLWAS)
  - INITIATED WORK ON NEW YORK TERMINAL RADAR APPROACH CONTROL (TRACON) UPGRADE
  - INITIATED WORK ON PROTOTYPE CENTER WEATHER PROCESSOR (CWP)
  - ESTABLISHED PROTOTYPE MAINTENANCE CONTROL CENTER AT GENERAL NAS SECTOR
  - COMPLETED AUTOMATED EN ROUTE AIR TRAFFIC CONTROL (AERA 2) FUNCTIONAL SPECIFICATIONS

SUMMARY

- MAJOR NAS PLAN PROJECTS ARE PROCEEDING AND SIGNIFICANT PROGRESS HAS BEEN MADE
- OUT-YEAR FUNDING LEVELS ARE STILL BEING DEVELOPED ALONG WITH AUTHORIZATION LEGISLATION
- PUBLICATION OF 1986 UPDATE WILL BE DELAYED UNTIL SEPTEMBER

SYSTEM ENGINEERING AND INTEGRATION CONTRACT

SYSTEM ENGINEERING AND INTEGRATION CONTRACT

- AWARDED JANUARY 31, 1984, TO MARTIN MARIETTA
- SUPPORTS FAA IN NAS PLAN IMPLEMENTATION
- COST PLUS AWARD FEE
  - FEE AWARDED EACH 6 MONTHS
  - BASED ON SEI PERFORMANCE AND ACHIEVEMENT OF NAS PLAN OBJECTIVES

MAJOR AREAS OF WORK

- CONTRACT ADMINISTRATION/INTERNAL SEI CONTRACT MANAGEMENT
- TOP-LEVEL NAS PROGRAM MANAGEMENT SUPPORT
- SYSTEM-LEVEL ENGINEERING AND INTEGRATION
- PROJECT ENGINEERING SUPPORT AND IMPLEMENTATION PLANNING

PROGRESS--CONTRACT ADMINISTRATION/ INTERNAL MANAGEMENT

FISCAL MANAGEMENT:

- ORIGINAL 10-YEAR CONTRACT VALUE WAS $684.1M
- CONTRACT MODS HAVE ADDED $96.7M TO 10-YEAR CONTRACT
  - INCREASED SUPPORT TO AAS
- CUMULATIVE FUNDING THROUGH FY 1987 WILL BE $275.7M
- ADDITIONAL CONTRACT MODS BEING NEGOTIATED TO PROVIDE:
  - EARLIER AND BROADER TECHNICAL SUPPORT TO OTHER NAS PROJECTS
  - EARLIER AND GREATER SUPPORT TO REGIONS IN IMPLEMENTATION PLANNING

PROGRESS--CONTRACT ADMINISTRATION/ INTERNAL MANAGEMENT (CONTINUED)

FACILITIES;

- SEI HEADQUARTERS STAFF OCCUPIES TWO BUILDINGS ON SCHOOL STREET
- OFFICES ESTABLISHED ALL NINE REGIONS AND FAA TECHNICAL CENTER
- COMPUTER FACILITY OPERATIONAL WITH TELECOMMUNICATIONS LINKS TO REGIONS/FAA TECHNICAL CENTER VIA F.T.S.

STAFFING;

- STAFFING ON BUILDUP PLAN
- STAFF WILL BE 1008 IN SEPTEMBER 1986

PROGRESS--TOP-LEVEL NAS MANAGEMENT SUPPORT

- MASTER SCHEDULE BASELINED
- FISCAL PROGRAM BASELINED
- PROGRAM CONTROL TOOLS IN PLACE AND OPERATING
- MANAGEMENT PROCESSES IN PLACE AND OPERATING
    - PROJECT STATUS REPORTING
    - SCHEDULE CHANGE CONTROLS
    - FINANCIAL STATUS MONITORING AND CONTROL
    - CONFIGURATION MANAGEMENT (AT ALL LEVELS)
    - BENEFITS ANALYSIS
    - NAS PROGRAM PLANNING

PROGRESS--SYSTEM-LEVEL ENGINEERING

- NAS SYSTEM DESIGN DESCRIPTION--BASELINED OCTOBER 1984
- NAS SYSTEM REQUIREMENTS SPECIFICATIONS--BASELINED MARCH 1985
- INTERFACE MANAGEMENT PLAN--APPROVED FEBRUARY 1986
- MASTER TRANSITION PLAN--TO BE COMPLETED SEPTEMBER 1986
- NAS SYSTEM SPECIFICATIONS--TO BE COMPLETED SEPTEMBER 1986

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PROGRESS--PROJECT ENGINEERING SUPPORT AND IMPLEMENTATION PLANNING

- SEI IS PROVIDING ENGINEERING SUPPORT ON ALL MAJOR PROJECTS
  - PROCUREMENTS
  - TECHNICAL MANAGEMENT
  - COST/RISK ASSESSMENTS
  - SOFTWARE IV&V
  - TEST PLANNING
- IMPLEMENTATION PLANNING
- REGIONAL TRANSITION PLANS--MODEL PLAN COMPLETE

PROGRESS--PROJECT ENGINEERING SUPPORT AND IMPLEMENTATION PLANNING (CONTINUED)

- MODEL FACILITY TRANSITION PLANS

  ARTCC/ACF -- MAR 86
  AFAS -- MAY 86
  ATCT -- JUNE 86
  AIRPORTS -- JULY 86
  REMOTE FACILITIES -- AUG 86

- IMPLEMENTATION SUPPORT PLANS

  ARTCC BUILDING EXPANSION DESIGNS--COMPLETED
  NAS INTEGRATED LOGISTICS SUPPORT--DRAFTED
  NAS TRAINING PLANS--DRAFTED

SUMMARY

- SEI CONTRACTOR ROLE UNDERSTOOD AND MATURE
- NAS PROGRAM MANAGEMENT PROCESS IN PLACE AND OPERATING
- SIGNIFICANT ACCOMPLISHMENTS IN:
  - NAS PLANNING SUPPORT
  - SYSTEM ENGINEERING/DESIGN
  - PROJECT SUPPORT
  - IMPLEMENTATION PLANNING

Major Project Status

Terminal Radar Program (ASR-9)

Objectives:

- Replace 96 Vacuum-Tube Radar Systems With Solid State
- Leapfrog 56 ASR 7/8 to ASR 4/5/6

Status:

• Contract Award	FY 83 Completed
• First System Delivery (Operational Site)	FY 87
• First ORD	FY 87
• First Leapfrog Installation	FY 88
• Last Leapfrog Installation	FY 90
• Final Delivery	FY 90
• Last ORD	FY 90

Long Range Radar Program

Objectives:

The NAS Plan Requires the Networking of En Route Radar, Terminal Radar into a Cost-Effective System Providing Primary Radar Coverage of Both En Route and Terminal Airspace. Vacuum Tube Radars Will Be Refurbished. DOT and DOD Jointly Will Participate in the Development and Acquisition of Replacement Three-Dimensional (3-D) Radar.

Status:

A. Refurbishing Vacuum-Tube Radars

Contract Award	FY 85
First Delivery	FY 87
Last Delivery	FY 88

B. Three-Dimensional (3-D) Radars

Contract Award (3-D Radars)	FY 88
First Delivery (3-D Radars)	FY 91
Last ORD (3-D Radars)	FY 94

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Microwave Landing System (MLS)

Objectives:

Develop and Implement New Terminal Guidance System With Improved Accuracy and Operational Flexibility.

Status:

• Contract Award (1st Buy)	**FY 84 Completed**
• First Production Delivery (1st Buy)	**FY 87**
• Contract Award (2nd Buy)	**FY 87**
• System Delivered to 1st Operational Site	**FY 89**

Loran-C

Objectives:

Define Requirement for Integration of the Loran-C Navigation System into the NAS; Conduct Necessary Procurement and Implementation Projects to Meet FAA Responsibilities in the Use of Loran-C in the NAS as an Interim Supplemental Aid, and Support Transition to the Future Navigation System, or Mix of Systems, Selected in the Joint DOD/DOT Recommendation.

Status:

• Contract Award (Systems)	FY 87
• Contract Award (USCG — Transmitters)	FY 88
• System Delivered to 1st Operational Site	FY 89
• First ORD (Transmitters)	FY 91

Flight Service Automation System (FSAS)

Objectives:

- Promote Flight Safety Through More Accurate and Timely Pilot Briefings
- Meet Forecasted Increased Demand for Services (79 Percent Growth in Hours Flown by 1993)
- Reduce Costs to Provide Services ($1.3 Billion Over 17 Years)

Status:

Contract Award	1981 (Complete)	
	M1	M2
First Implementation	1985	1990
Last Implementation	1987	1991

Automated En Route ATC (AERA)

Objectives:

- Develop and Implement Automation Features to:
  - Facilitate User Preferred Routes
  - Increase Controller Productivity
  - Enhance Safety (Reduce Blunders)
- AERA 1: Alert Controllers to Predicted Conflicts
- AERA 2: Propose Conflict Resolutions to Controllers
- AERA 3: Automate Routine Controller Tasks and Conflict Resolutions

Status:

• AERA 1:	
– Functional Spec to AAS DCP Contractors	FY 85 Completed
– First Site Operational	FY 94
• AERA 2:	
– Draft Functional Spec Completed	FY 86 Completed
– Functional Spec to AAS AP Contractor	FY 88
– First Site Operational	FY 97
• AERA 3:	
– Draft Functional Spec Completed	FY 89
– Field Testing at First Site	FY 99

Mr. **Brown**. Mr. Hunt, you may proceed.

Mr. **Hunt**. Thank you, Mr. Chairman.

[Chart presentation.]

Today I plan to talk about the advanced automation program in three parts. I plan to give an overview of the system. I plan to talk about recent events and provide a short summary.

The program strategy developed early in the program was based upon three significant events. First, because the 9020 computers were getting old and wearing out, we decided to replace those with a new modern computer hardware set and use the old software.

Second, we would introduce a new workstation for the air traffic controllers.

Third, we would introduce the complete new advanced automation system consisting of both new hardware and software.

These are major steps and to allow the system to stabilize, the users to become familiar with the equipment, and the maintenance people to become comfortable with maintaining it, we would allow two years to elapse, at least two years between each of these major steps. The Host computer goals were threefold, to increase the computer capacity, to allow functional capabilities to be increased, and to provide better hardware reliability.

Now we were faced at that time with the question of whether or not a contractor would be able to rehost the software on a computer of his choice, so we decided upon a two-phase approach where there would be a design phase and we would select two contractors to demonstrate by the performance of certain tests that his computer could in fact, rehost the existing software. Then the followon to that would be to select one of those two contractors for full system acquisition. We did select IBM for the full system acquisition last summer.

The scope of work for the acquisition is to provide operation systems at all 20 en route centers. One at the technical center at Atlantic City. One at the aeronautical center in Oklahoma City, and one each for the advanced automation system design contractors to allow them to transition their system from the Host to the new environment.

The problem was to rehost the NAS software with the absolute minimum number of software changes to rehost the current version of the software, to maintain standard instruction interface, such as the 360/370 computers have; to provide a system support facility at Atlantic City at the technical center; to provide a training system at the academy; and to provide a fully integrated support system, including documentation and training.

The major milestones are shown here. The design contracts were awarded in September of 1983. The acquisition contract was awarded to IBM in 1985, in July.

The first operational site is scheduled to become operational in November of this year. The remaining sites are scheduled for completion by December of next year.

Looking at the accomplishments, we did complete the design contracts in 1985. We awarded the acquisition phase contract last July. The production software tests for the acquisition contract have been in progress since January of this year and we expect those to be completed this summer.

First site operational readiness date is, as I have said, November 1986; last site is December 1987.

Looking now at the advanced automation system proper. We decided upon what has been described as a clean-sheet design. That is to take the functional requirements for the air traffic controllers and to base the system design entirely upon a new look rather than incorporating some of the older design approaches, this would take advantage of new technology that has evolved over the last 20 years.

We would provide new sector suites for the controllers to use; a new modern distributed computing network; and a totally newly developed software system. The transition from the rehosted NAS to the full advanced automation system would be a major responsibility of the contractor here, and we would provide systems for all 20 area control facilities.

Our goals were to enhance the productivity of the controllers; and to allow increased automation functions, as Mr. Pozesky has just described—to improve productivity of the system users; to provide compatibility with advanced cockpit systems which use large number of computers; to provide fuel efficient routing; to provide improved weather availability in the cockpit; and to provide something called en route metering, which will help relieve the congestion that we see at some of our terminal areas today.

The capability to support the AREA 3, that Mr. Pozesky described a moment ago, to handle traffic through the year 2010; to reduce maintenance costs; and to provide system lifetime of at least 20 years.

Once again we adopted a strategy which depends upon two competitive design contracts. The scope of work there would be to provide a full system design and to build and demonstrate sector suite prototypes. The competitive contracts would extend through the completion of this system design and the completion of the prototype testing. Then based upon full technical, management, and cost proposals, the FAA would select one of those two contractors for full system acquisition.

The design contracts would last 3½ years; and the acquisition contract about 6 years.

Implementation objectives are that the new sector suite would be operational beginning in 1991, and that AERA 1 would become available in 1993; and AERA 2 by, say, 1995.

Another aspect of the system is that it would consolidate the TRACON's that currently exist at major airports into the area control facility.

The major milestones are shown here. We have awarded the design contracts in August 1984. We are approaching the critical design review in May 1987, about a year from now.

The prototype demonstration of the sector suite is scheduled for next January, and we have allocated four months to that demonstration. The acquisition contract awards would occur in January 1988.

Initial installation of the new sector suite would begin in February 1990, and the first operational dates would become May 1991.

The full advanced automation system would be installed beginning in August 1991, and would become operational 2 years thereafter.

Now looking at recent events in both of these programs. The Host contract acquisition phase was awarded in July of last year. And I might say, that the cost of that contract was $86 million less than the estimate that was included in our budgets, and we believe that this is a direct result of competition in the design phase.

They began the testing last October, it became intensive in January of this year. We think that performance to this date has confirmed that the computer systems are more reliable than the forecasts that we had made earlier would indicate.

The development testing is going well. We have delivered five systems so far, all to nonoperational sites. Construction contracts at all 20 centers have been awarded. Progress is very good. At four sites, work is better than 75 percent complete.

There are at least nine sites that are better than 50 percent complete; that is proceeding very well. The first site to accept the Host computer is Seattle, and that building is ready for computer installation at this time.

We began testing software that will be used at Seattle in January, as I said earlier, at the technical center in New Jersey. We plan to do the site simulation testing for the six centers that listed are below.

Now there was a question last year concerning the capability of the Host computer system to handle traffic levels that would exist out through 1995. It is a very heavy workload. That there was some concern about whether we could, in fact, handle that level of traffic. That was the subject of a GAO report. At that time they urged us to delay the contract award for further testing to demonstrate that this capacity need could be met.

The FAA decided to proceed with the original plan and the acquisition phase contract was awarded last summer. The Host computer was estimated to require 43 percent of its capacity to handle the workload that would exist in 1995.

The formal capacity testing is scheduled to begin in July of this year. But we have already conducted preliminary tests of that 1995 capacity, and we show the utilization is in the range of 30 to 34 percent.

Although these tests were preliminary, we should consider them as valid tests because all of the requirements of the tests procedures were complied with, they were just not run for the record.

The results indicate that the concerns expressed by the GAO last summer are not going to materialize and that, in fact, the performance of the computers is better than we had predicted last year. We feel that they were overly pessimistic and conservative in their recommendation to delay the program last year.

Turning now to the advanced automation system, I did not previously mention that part of our structure for that program involved preparing full scale mock-ups of the air traffic controllers workstation. These mock-ups were demonstrated with air traffic controllers performing a number of actions that would normally be required in their day-to-day control of air traffic. That was done last summer.

The results were very successful. They proved that the physical design of the man/machine interface would very adequately meet the FAA's needs. As Mr. Frisbie has testified earlier, we did add some requirements to the advanced automation system contracts last fall, color display is now a part of the system.

To provide a better, more uniform man/machine interface we also gave the advanced automation system design contractors the responsibility for the control panel for a companion system, the voice switching and control system, that is a communications system to allow the controllers to talk to the aircraft.

We did upgrade the requirements for AERA based on the analysis of our air traffic controllers. We completed the system architecture review in November, and the system design review in January of this year.

Now last June the GAO folks expressed in a formal report the same concerns that you heard expressed this morning about the system. The FAA did formally reply to this report in January of this year.

This committee has a copy of the FAA's report. We believe that the FAA is proceeding on the right path on this program. We think that GAO is being ultra-conservative.

I would just like to say personally, as a member of the aviation community for the last 46 years, that I am glad the Wright Brothers were not faced with cost-benefit justification. I don't believe they could, in their wildest imagination, foresee the huge benefits that their flight has brought to this country.

I think that you have to be a little bit careful about viewing the cost study as an absolute justification for investment in a new system.

I think there are number of reasons why it is not prudent to delay the program by 2 years for additional testing as the GAO has recommended. I think first of all that you are not going to improve the risk reduction that much by the 2 additional years.

Instead I think what we would get is two software systems that would both have a number of problems in them and you would have to work with two systems to try and weed out the problems that are always inherent in a new software system, this would impose an additional burden on the FAA staff to monitor two contracts instead of one.

I think that the investment that you would make in the second contractor that does not win the acquisition phase contract would be largely not justified, much of what he would have done would have been wasted. The current cost for the design competition phase as we have structured it is 15 percent of the total system cost. If we follow the GAO's suggestion that would increase to 25 percent.

We do not believe that there would be a risk reduction that would warrant that additional 10 percent investment.

Last year the Congress did direct the FAA to conduct a new cost study that was to be done independent of the program office, and so I am just reporting on the status here. It was initiated in March 1986, and the personnel and the contractors are now identified to be MITRE, SRSA, and TASC.

Mr. Dale McDaniel is here to answer any further questions that might arise on that study.

Turning now to the final project that is assigned to the advanced automation program office, the voice switching and control system, this is a system that will replace the communications system that is now leased from the Bell System with modern computer managed switching apparatus to allow the controllers to talk with the aircraft and with their peers at other locations.

Proposals were received for this system last year, they have been under evaluation and we expect an award to be made some time this summer, probably in June.

So, in summary, Mr. Chairman, both Host and AAS contracts are progressing rapidly, construction is underway and we feel that the sites are ready to receive the equipment. We are having some difficulty in the completion of the tests, and we look for, perhaps, 3-month or so slip on the part of IBM, but we think that is normal.

Surprisingly one of the major causes for that is documentation. Let me just explain that a bit. The requirement is to take the documentation for the existing 9020 system and to update it and modify it wherever there have been changes made associated with the new Host computer.

It was planned to take that documentation and put it into a data base through the use of optical character reader equipment. It turned out that because of the low quality of the old documentation that was not a feasible approach, and so we have had to key it in manually, and we now have a battery of keypunch operators who are doing that work for us, so that has delayed our program a couple of months.

But we are highly confident that the system will be deployed soon and it will turn out to be an excellent addition to the inventory.

Thank you.

[The charts follow:]

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Advanced ATC Automation

Subcommittee on Transportation, Aviation and Materials

April 23, 1986

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Agenda

- Overview
- Recent Events
  - Host
  - AAS
  - VSCS
- Summary

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Overview

Program Strategy

- To realize early gains and reduce overall program risk, adopt a phased introduction of new systems elements into operational sites:
  - First, install new Host computer, using old NAS software
  - Second, introduce new Sector Suite, using Host computer, NAS software, with some new software
  - Third, introduce the remaining new system elements, including new software
  - To permit the system to stabilize, allow 2 years between each of these three steps

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Host Goals

- Increased computer capacity
- Increased functional capability
- Increased hardware reliability

Host Program Plan

- To eliminate risk of selecting a contractor unable to rehost the NAS software, a Design Competition Phase (DCP) was conducted
- One of the two DCP contractors (IBM) was selected for the Acquisition Phase

Host Acquisition

- Provide operational systems at 20 ARTCCs, one each for FAATC and FAAAC, and one each for AAS / DCP contractors
- Rehost NAS software with absolute minimum number of software changes
- Maintain standard 360 / 370 instruction set hardware / software interface
- Provide system support facility at FAATC
- Provide training system at FAA Academy
- Provide fully integrated logistic support system, including documentation and training

Host Major Milestones

• Design Contract Awards	September 1983
• Host Acquisition Award	July 1985
• First Operational Site (Seattle)	November 1986
• Remaining Host Sites Complete	December 1987

Current Program Status

Host Detailed Schedule

Milestone	Schedule
Key Decision #3	Complete
DCP Contract Awards	Complete
Design Review	Complete
DCP Tests at FAATC	Complete
Key Decision #4	Complete
Acquisition Contract Award	Complete
Production S/W Tests at FAATC	May 1986
First Site ORD	Nov 1986
Last Site ORD	Dec 1987

Advanced Automation System (AAS)

- Perform a "Clean Sheet" design of a new system to meet the requirements of the 1990s. Include both en route and terminal functions
- Provide:
  - New Sector Suites
  - New modern distributed computing network
  - New software
- Provide a phased transition from the rehosted NAS to the full AAS
- Provide systems for all Area Control Facilities (ACF)

Goals

- Enhanced FAA productivity
  - Controller productivity
  - Increased automation in ATC
- Improved user productivity
  - ATC compatibility with advanced cockpit systems
  - Fuel efficient routing
  - Improved weather service
  - En Route Metering II
- Capability to support full AERA
- Traffic capacity adequate beyond turn of century
- Reduced maintenance costs
- Automation system architecture with at least 20 - year life

AAS Procurement Strategy

- Competitively award two contracts for system design, and demonstration of sector suite console prototypes
- Competitive contracts will extend through completion of design, including critical design review
- Based on full technical, management, and cost proposals, select one of the two design competition contractors for full system acquisition
- Estimated duration of design contracts - 3½ years
- Estimated duration of acquisition contract - 6 years

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AAS Implementation Objectives

- New Sector Suite operation beginning in 1991
- Higher levels of ATC automation at area control facilities by 1993 (AERA - 1) and continuing throughout the 1990s (AERA - 2 and 3)
- Consolidation of TRACONs through Area Control Facilities concept

Advanced Automation System Schedule

Milestone	Schedule
Request for Proposals	Complete
Design Competition Awards	Complete
AAS Critical Design Review	May 1987
Sector Suite Prototype Demonstration	Jan-Apr 1987
Acquisition Award	Jan 1988
Initial Sector Suite En Route Installations	Feb 1990 - Jul 1991
Initial Sector Suite En Route Operational	May 1991 - Apr 1992
Full AAS Installation En Route	Aug 1991 - Apr 1993
Full AAS Operational En Route	May 1993 - Apr 1994

Recent Events

Host Recent Events

- Acquisition Phase (AP) Award
- Design Competition contract achieved savings of over $86 million on Host Acquisition Phase Award
- Computer Test Program began October 1985
- Host computer hardware systems are operating well within reliability tolerances during on-going testing
- Development testing progressing well
- Five Host hardware systems delivered

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Host Recent Events (cont)

- All construction contracts have been awarded
- Four sites greater than 75% complete
- First site (Seattle) ready to accept computer installation
- Host testing of individual field site adapted software for Seattle began on January 7, 1986 at FAATC
- This "Site Simulation" testing will be done for Seattle, Houston, Denver, Leesburg (Washington, D.C.), Boston, and Chicago

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Host Capacity Testing

- The new Host Capacity Test is designed to represent the forecasted workload for 1995. It is a significantly heavier workload than can be handled by the existing computers.

- As described in "Response to Congressional Concerns Regarding the FAA's Advanced Automation Program for Air Traffic Control," DOT/FAA/AAP-85-1, February 1985, the Host Computer must pass this test before it is deployed to field sites.

- The Host Computer is required to handle the capacity test workload with a processor utilization of 43 percent or less.

Host Capacity Testing (cont)

- Formal capacity testing is scheduled to begin in July 1986.
- Results of preliminary test runs show a processor utilization in the range of 30 to 34 percent.
- Although the tests were preliminary, they included all contract test requirements and the results should be considered as representative of formal testing.
- The favorable capacity test results indicate that the concerns expressed by the GAO (GAO/IMTEC-84-14) will not materialize. The margin of capacity between the preliminary test results (30 to 34 percent) and the specification requirement of 43 percent or less provides a very high degree of confidence that the forecasted 1995 traffic levels can be easily handled by the Host Computer.

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Advanced Automation System (AAS)
Recent Events

- Mock-up reviews successfully completed - July 1985
- Contract modification issued for:
    - Color
    - VSCS Control Panel
    - Automated En Route ATC (AERA) 1
- AAS Architecture Review completed - November 1985
- AAS System Design Review (SDR) successfully completed by contractors on schedule - January 1986

GAO/Congressional Concerns

- GAO Report: FAA's Advanced Automation System (AAS) and Automated En Route Air Traffic Control (AERA) Program (Report GAO / IMTEC-85-11, June 17, 1985)
- Appropriation Committees of both House and Senate expressed concerns
- Response to Congress "FAA Response to GAO Interim Report IMTEC-85-11" submitted January 29, 1986

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Congressionally Directed Cost / Benefit Study

- FY 86 continuing resolution directed that an organization, independent of the Advanced Automation Program Office, conduct a cost / benefit study
- Status of study
  - Initiated March 3, 1986
  - Special project formalized
  - FAA support personnel identified
  - Support contractors identified
    - MITRE
    - SRSA (System Requirements and Services Association Inc.)
    - TASC (The Analytic Sciences Corp.)

Congressionally Directed Cost / Benefit Study (cont)

- Study activity to be guided by Steering Committee
  - Chairman: Dale McDaniel, Deputy, Associate Administrator for Policy and International Aviation
  - Steering Committee Representatives from:
    - Associate Administration for Development and Logistics
    - Associate Administration for Air Traffic
    - The Administrator's Special Projects Staff
    - Regional Director
    - DOT's Office of The Secretary
    - Transportation Systems Center
    - Office of Management and Budget
- First meeting held 4/10/86

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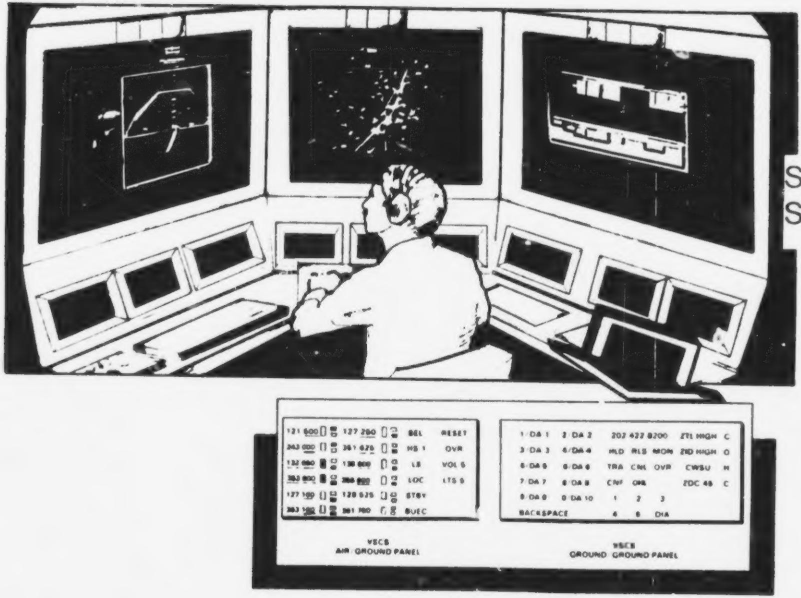
VOICE SWITCHING AND CONTROL SYSTEM (VSCS)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BEL
RESET
243 000
361 675
HS 1
OVR
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LS
VOL 5
LOC
LTS 5
127 100
120 625
STBY
BUEC
1/DA 1
2/DA 2
202 422 8200
ZTL HIGH
3/DA 3
4/DA 4
HLD
RLS
MON
ZID HIGH
5/DA 5
6/DA 6
TRA
CNL
OVR
CWSU
7/DA 7
8/DA 8
CNF
OHL
ZDC 46
9/DA 9
0/DA 10
1
2
3
BACKSPACE
4
5
DIA
VSCS
AIR/GROUND PANEL
VSCS
GROUND/GROUND PANEL

Voice Switching and Control System (VSCS)
Recent Events

- VSCS is the controllers' communication device which links controllers together and to aircraft under their control
- VSCS prototype development proposals received and evaluated; contracts to be awarded in June 1986

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Summary

- Both Host and AAS are progressing rapidly
- Construction is underway or completed at all sites
- First Host operational readiness date may be extended 1 month to complete testing
- AAS Acquisition Phase Award scheduled for January 1988
- Award of VSCS design contracts expected in June 1986

Mr. **Brown**. Mr. Lewis.

Mr. **Lewis**. No.

Mr. **Frisbie**. We will proceed down and ask Mr. Blake to talk about aviation weather and the balance of the R&D program.

Mr. **Blake**. Thank you, Mr. Chairman. I will start with a brief overview of the aviation weather program, and some of the near term improvements are shown in this vugraph.

[Chart presentation.]

The hazardous in-flight weather advisory system is operational in three air traffic control centers, the Miami, Jacksonville, and Houston centers. And in fiscal year 1986 we will be receiving the funds that we need to buy recording equipment for the remaining systems and we will have the capability nationwide during 1987.

This system provides forecast information on severe weather in the form of SIGMET's, and these are significant weather advisories to airmen, and current information on severe weather hazards in the form of center weather advisories which come from the meterologists in our traffic control centers. This information is broadcast continuously over our VOR frequencies.

Use of displays of existing National Weather Service radar by controllers in the air traffic control towers was examined at several of our control towers during 1985. This examination indicated that insufficient data was available to identify hazardous weather phenomenon which existed within the precipitation contours presented on the weather displays.

We have discussions underway with the National Weather Service to see whether contours could be developed at a weather service facility, transmitted to our control displays, and presented on those displays in real-time or near real-time to controllers.

We have made significant progress in the wind shear area. A contract was awarded during late 1985, to a team of companies to develop a comprehensive pilot training program in wind shear.

This program will develop a course of instruction which includes the nature of the wind-shear hazard, recognition and avoidance of wind-shear conditions, and piloting techniques which will provide the best aircraft performance should an aircraft encounter such a shear. This contract will be completed in early calendar year 1987.

A joint program has been initiated with NASA Langley on the development of airborne systems for the detection of wind shear and for provision of flight guidance to pilots in avoiding or obtaining the best performance from aircraft if a shear is encountered. The program addresses several areas.

One is the improvement in existing detection systems to determine the degree to which these systems can, in fact, detect wet or dry microbursts.

On activity is designed to determine the extent to which airborne Doppler weather radar performance can be improved for the detection of microbursts. This is an extremely difficult task since the radar antenna is small, the transmitter power low, and the processing to remove the ground clutter signals is extremely difficult.

The second effort in the sensor area will determine the extent to which laser lidar devices and other technologies can be developed to detect microbursts generally and in particular the dry microbursts.

Another part of the program addresses improvements that can be made in the flight guidance provided to the pilot during recovery from a wind-shear encounter. A related activity is continuing the characterization of the wind shear hazard.

This activity will determine the flight guidance improvements needed to properly account for the effects for the ring vortex which forms at the perimeter of the microburst itself. A future task will address the integration of forward looking sensors with the improved flight guidance avionics to provide a system that will allow the pilots to detect and avoid wind shear conditions.

We have many technical problems to resolve in this program, and the joint program is scheduled to extend over a 5-year time period. It is being conducted with the full participation and cooperation of the industry, and as results are available from the program, they are made available directly to the companies for improvement of their products.

The Nexrad Program is now in the prototype test phase. These tests will be completed during fiscal year 1986, and the contract award for limited production systems is expected in January of 1987. The limited production will provide 10 units to the 3 services, and full production will provide 162 units.

The production release for the 162 units is currently expected in January 1988. System deliveries will occur starting in January 1989, and the last unit will be available in September 1993.

During fiscal year 1986 the two Nexrad contractors conducted design studies for a terminal version of the Nexrad system. Two of the limited production Nexrad systems will be delivered with the terminal modifications in place, and that is from the limited production program.

The remaining 13 terminal Nexrads will be delivered as a part of the production contract, and deliveries are expected 1989 through 1991.

During 1985, FAA tested a prototype of our terminal Doppler weather radar in Memphis, TN. This program resulted in the definition of the technical parameters such scanning strategies, types of displays, and also provided some initial testing of the automatic detection and warning algorithms.

During the test period which covered the summers of 1984 and 1985, nearly 100 microbursts were detected in the Memphis area; two of these occurred in the approach and departure corridors to the airport.

Approximately 25 of the mircroburst detected were of the dry variety. This occurred in a very humid part of the United States.

In the fall of 1985, the system was moved to Huntsville, AL, and will be used during 1986 for further development and testing of the automatic detection and warning algorithms which will ultimately provide microbursts warnings to the tower controllers, and also to the Tracon controllers.

The FAA radar will be operated in conjunction with the project MIST, which is a joint program with the National Science Foundation and the University of Chicago, to study microbrusts and severe thunderstorm activity in the humid southeast part of the United States. The FAA also plans to do some comparison testing with the ASR-9 radar at Huntsville, AL during the same time period. The fiscal year 1987 activities will include further testing of the terminal Doppler radar prototype, including a planned operation test at an air traffic control tower.

Implementation of the low-level wind shear alerting system at 110 sites is being completed. The R&D leading to a definition of enhanced system will be conducted and completed during fiscal year 1986.

The enhanced system will have additional sensors and it will have additional processing, data recording and archieving, and improved display formats. Wind shears will be reported in the future in along runway and across runway wind-shear components. We believe this format will be a great deal better for the pilots to use.

A contract for enhanced systems at 110 sites is currently scheduled for February 1988, with delivery scheduled for the period 1990 through 1992.

The automated weather observing system, we have solved the sensor problems that we have had in the past and are currently in the production design phase of the AWOS contract. Deliveries are scheduled for 1988 through 1990. In addition, we are planning to start a second procurement for additional systems with an award planned for 1987 with equipment deliveries in 1989 through 1992.

These systems will be installed at nontowered airports to provide the basic metorological information including wind speed and direction, temperature, dew point, altimeter setting, visibility, cloud height, and precipitation.

Development of the Central Weather Processor is continuing. This system accepts information from the Nexrad radars and meteorological products from the National Weather Service and provides processed information to the meteorologists. The meteorologist uses the information to prepare aviation short-term forecasts and severe weather advisories.

In addition, the meteorologist generates graphical products identifying weather hazards. It is these processed products which are generated both by the meteorologist and by the automatic algorithms that are provided to the controller as an overlay on the air traffic control display and to the pilot via the Mode-S data link.

During fiscal year 1986, the FAA conducted a detailed review of the system requirements and completed the system functional definition for CWP. Also, in 1986, the Office of the Federal Coordinator for Meteorological Services established an Automated Weather Information System Council to coordinate the activities being conducted under the Center Weather Processor Program, the National Weather Service automated weather information processing system of the 1990's, and the corresponding military systems.

This council has been established to assure complete coordination between the programs and standardization of all commonly used meteorological products. The council was established in February of this year, and has had two meetings to date.

In addition to the program efforts I have just described, Dr. John McCarthy of the National Center for Atmospheric Research, working with a group of technical experts, completed a report during 1986 which provided a number of recommendations covering the areas of pilot weather training and near-term weather improvements in forecasting, particularly as they relate to severe weather hazards. And the FAA will be reviewing these recommendations during fiscal year 1986 with a view toward implementation of needed improvements, particularly in the short-term forecast area.

Now I would like to shift to the second and last topic, Aircraft Safety and Security Program. The aircraft safety programs continues to place emphasis on developing post-crash fire prevention techniques and has placed greater emphasis on solution of in-flight fire detection and extinguishment of in-flight fires, fire and impact characteristics of composite materials, and improved methods of explosives detection. Some of the highlights of the fiscal year 1987 program are shown here and include:

Development of a program plan for new directions/initiatives in fuel research and methods of preventing or mitigating the hazards associated with post-crash fuel release. A Government/industry fuels workshop was held during the fall of 1985, and this provided a comprehensive review of our current technology and resulted in user recommendations for future activities in this program.

In the cabin fire safety area, we are continuing our program in the detection, suppression, and extinguishment of in-flight fires, in the comparison of the effectiveness of several types of fire fighting systems, in determination of the optimal flight profile and control of cabin ventilation and cabin pressure. Studies will continue on determining the burn-through resistance of composite materials as they will be used in aircraft structures.

Mr. LEWIS. Mr. Blake, what progress is FAA making on changing the type of materials that can be used in the interior of an aircraft that are nontoxic?

Mr. BLAKE. In this area we are in the final stages of rule-making, which addresses the question you raised, and also establishes new test methods for the selection of cabin materials. We have just completed the user comment period on that rule. The final rule is in internal coordination within the administrators. So that should be out this year.

In the engine and fuel safety area we will continue our emphasis on improving engine and fuel system safety and also reliability, including continued work on a more fire resistant fuel as well as improvements in the fuel system.

In fiscal year 1987, we will be looking at the suitability of the current foreign object damage criteria which is used for second generation high bypass turbofan engines. And we will also be looking at the tolerance limits of small trubofan engines to bird ingestion, and this analysis will be done in fiscal year 1987.

Work will be completed on the winter and summer operation of high compression aircraft engines, piston engines on autogas, and also to complete the investigation of fuel aging and hot day aircraft climb performance.

In the flight safety area, we are continuing our long-term effort on all aspects of environmental characterization.

In the lightening area, we will be completing our lightening strike data collection effort this year. This has been a joint coopertive effort with the Department of Defense and NASA. And we are focusing particularly on getting cloud-to-ground strikes. And we will study the effect of the lightening characteristics on the aircraft structure and also on on-board avionics systems with a view towards developing updated protection standards.

The National Icing Council, which was set up by the Office of the Federal Coordinator for Meteorology and supporting services, and that council is made up of representatives from five agencies, the National Science Foundation, NASA, National Weather Service, Department of Defense, and Federal Aviation Administration.

This council has been determining ways of improving our ability to forecast icing conditions and to find less expensive ways to certify aircraft and helicopters for flight in those conditions. The national aircraft icing technology plan was published this year by the Office of the Federal Coordinator.

In the FAA icing program, in fiscal year 1987 we will be extending our atmospheric environment characterization data base from a national data base to a worldwide data base in the area of supercooled clouds above 10,000 feet, and also including snow conditions.

We are also continuing to investigate the use of simulation and analytical techniques in certification procedures to reduce the cost to industry of bringing new products and aircraft on line.

In the helicopter area, we will initiate research to produce relaxed static stability guidelines and advanced control system criteria for flight and engine control systems to provide improved handling qualities and climb performance criteria.

In the area of crash worthiness, we will focus on the performance and impact characteristics of advanced composite materials. We will also be transferring our knowledge gained in the transport aircraft area in the past to commuter, general aviation, and helicopter areas and continue our work on fuel system protection across the board.

In 1987 we will continue to build our data base on composite such that an adequate crash-worthy design can be defined.

We will modify our analytical techniques developed from the all metal-type structures to composite structures to predict seat restraint systems and aircraft performance in a crash impact situation. We will combine seat and airframe models, and develop a commuter small transport aircraft model.

In the aviation security area we will continue research in advanced explosive detection systems, improved concourse security through an integrated program, and determining the best method of handling bombs discovered after the aircraft is actually in flight, here focusing on the newer aircraft that have entered the fleet.

The Aircraft Security Program has been significantly expanded over the last several years and covers testing of an advanced thermal neutron detection system for baggage and also cargo inspection and evaluation of several promising techniques for explosive vapor detection.

Mr. LEWIS. Mr. Blake, Admiral Engen mentioned on your research on chemiluminescence detection, when do you expect to have something like that on line?

Mr. BLAKE. We will be testing the chemiluminescence technique in fiscal year 1987. Assuming the results are as we expect them to be, we will be combining that with a walk-through passenger portal in fiscal year 1988, and will be conducting tests of the combined sensor.

So we can do both the metal detection and the explosive vapor detection with a single device. That testing will be in 1988.

Mr. LEWIS. Is there any way that can be accelerated; what will it take to accelerate that research or is it just going to take that period of time in order to make a determination whether you have an operable system?

Mr. BLAKE. I think we have adequate resources to bring this off as quickly as possible. We are, of course, developing a new technology and it does take some time. The results to date, though, have been encouraging.

Mr. LEWIS. You are saying 1988; is there is a possibility of having this pretty much ready to go in 6 months?

Mr. BLAKE. No, sir. I think the normal contracting process, development process, will take a little longer than that. But we are placing a high priority and adequate funding on the program and will bring it along as rapidly as we can.

Mr. BROWN. I think Mr. Lewis is probably thinking of the fact that there is a very strong public and political concern about this issue as a result of the increasing incidence of terrorism. If there are any fiscal limitations, you should tell us because they could probably be eliminated.

Mr. FRISBIE. Mr. Chairman, we testified earlier this week, as you know, before the Appropriations Subcommittee, and at that time we indicated that if we got to a point where money or lack of money was holding up this program, that we would come back and ask for that money.

Mr. LEWIS. I just want to make sure that it is not on the back burner, that it is moving as rapidly as possible.

Mr. BLAKE. No; in this area we are putting all possible emphasis on getting the products out as soon as we can. We are also looking at a variety of new technology beyond these systems, and as those look attractive through analysis, we will be putting some of them into test systems as well.

In the last vugraph, in the regulatory area, we have supported the final rule for shoulder harnesses for newly manufactured general aviation aircraft, the seat strength notice of proposed rulemaking, the cargo compartment liner improvement rule, and the interior cabin materials tests methods and criteria, and that was the one we spoke of a moment ago. We decided not to proceed with any rulemaking at this time on antimisting fuel.

Our rulemaking support in the fiscal year 1987 budget will be on the transport and general aviation seat strength and dynamic testing area, crash resistant fuel systems, crash scenario models, which will come out in the form of an advisory circular; and analytical modeling in crash situations, which will include both aluminum and composite aircraft.

That is a very brief summary of Aircraft Safety and Security Program.

[The charts follow:]

Aviation Weather

Near-Term Programs

- Hazardous In-Flight Weather Advisory System
- Control Tower Use of Existing Weather Radar Data
- Pilot Wind Shear Training Program
- Airborne Wind Shear Detection and Flight Guidance Systems

Aviation Weather

(En Route) NEXRAD

- Joint NWS/USAF/FAA Program
- Prototype Tests Completed in 1986
- Limited production Award in 1987
- System Deliveries 1989-1993

Aviation Weather

NEXRAD Terminal Derivatives

- Terminal Derivatives Design Studies in 1986
- Memphis and Huntsville Prototype Tests 1985-1987
- Terminal Deliveries 1989-1991

Aviation Weather

- Low Level Wind Shear Alerting System
  - 110 Site Implementation Completed FY 1987
  - Advanced Program RFP in FY 1987
  - Delivery 1990-1992

295

Aviation Weather

AWOS

- **Production System Design Phase**
- **Deliveries 1988-1990**
- **Competitive Contract Award 1987**
- **Deliveries 1989-1992**

Aviation Weather

CWP

- Information Processing and Dissemination System for
  - Meteorologists, Controllers, and Pilots
- System Requirements Review Completed
- Automated Weather Information System Council Formed
- Prototype Delivery 1989

Aviation Weather

Aviation Forecast Task Force

- Report and Recommendations 1986

Aircraft Safety and Security

- Cabin Fire Safety
  - Post-Crash Fire Prevention Techniques
  - In-Flight Fire Detection and Suppression
  - Composite Materials Fire Characteristics

Aircraft Safety and Security

- Engine and Fuel Systems
  - Foreign Object Criteria for High Bypass Engines
  - Small Turbofan Engine Study
  - Effects of Auto Gas Use on High Compression Aviation Engines

300

Aircraft Safety and Security

- Flight Safety
  - Icing Environment Characterization
  - Lightning Characterization
  - Office of the Federal Coordinator for Meteorological Services and Supporting Research National Icing Plan
  - Helicopter Control System Evaluation

Aircraft Safety and Security

- Crashworthiness
  - Impact Characteristics of Advanced Composite Materials
  - Transport Technology Transfer to Small Aircraft
  - Modify Analytical Techniques for Use in Composite Aircraft Crash Impact Analysis

AIRCRAFT SAFETY AND SECURITY

Aviation Security

--Research on Advanced Explosive Detection Systems

--Improved Concourse Security

--In-Flight Bomb Handling

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AIRCRAFT SAFETY AND SECURITY

REGULATORY SUPPORT

FY 1986

- General Aviation Shoulder Harness
- Seat Strength NPRM
- Cargo Liner Improvement Rule
- Interior Cabin Materials Test Methods and Criteria

FY 1987

- Transport and General Aviation Seat Strength Dynamics Testing
- Crash Resistant Fuel Systems
- Crash Scenario Models
- Analytical Modeling in Crash Situation

Mr. **Brown**. Gentlemen, I will say that you have done a very professional and thorough job of presenting the program here. I am not at all sure that it resolves all of the conceivable questions, but we will have to digest this a little bit in order to determine that. We will seek to do that through our staff and other resources.

Mr. Lewis, do you have any final questions?

Mr. **Lewis**. No questions.

Mr. **Brown**. The two major problems that we indicated at the beginning, first, the reduction in funding below the plan as a result of fiscal and budgetary pressures, there is a very great feeling in the Congress with regard to the full funding of this and release of the trust fund surplus for that purpose.

On that point, could you, recognizing that you are all, of course, loyal supporters of the administration, could you indicate what position internally, in the FAA, that has been taken with regard to the pressures coming for reductions, and the Gramm-Rudman cuts; what posture do you take with OMB with regard to the effects of these and what do you try to defend, recognizing, of course, that you will defend the final decision under any circumstances; obviously there have been some compromises made here?

Mr. **Frisbie**. Mr. Chairman, it is, I believe, a matter of record, that we have to sent up to the Congress the request that we make internally of, first of the Office of the Secretary of Transportation and then of the OMB. So at the outset of the year we had more ambitious plans then were before you that we are asking support for now.

Mr. **Brown**. Well we have access to details of that. I just wanted to establish that point.

With regard to the differences between the FAA and the GAO, with regard to the hazards involved in your procurement process with regard to this complex automated technology. We don't have the ability to resolve that question here, but we are going to have to review those differences.

Our main concern is that you review them very closely, and that you be absolutely satisfied that you are right, because if you are not, the record will be that you had been warned that you weren't right, and you are not going to look good down the road. I think you are well aware of that; that no process is infallible.

We have had some very tragic accidents just quite recently with regard to other complex systems, the space shuttle, and the Titan 34(B), in which one of your contractors was involved in both situations. There is no such thing as infallible systems.

We would hope that you will give due consideration to the comments and criticisms in order to perfect the process that you are using as fully as possible.

As you know, this committee, and I am sure the Congress, is very supportive of the goals of the national air space plan, we want to see it move ahead, and to provide the results that are anticipated. As far as I am concerned, I don't want to nitpick with you about it. I just want you to do the best possible job that you can on that.

Mr. **Frisbie**. Mr. Chairman, if I might assure that we don't take the GAO criticism lightly at all. We are investing a great deal of time in looking at those challenges that they have made to the program, and critically examining the program ourselves to be sure of the same things that you are after, Mr. Chairman, that we don't preside over a program that is not going to succeed.

Up until now with literally hundreds of engineers looking at the program, we feel that with the milestones we have included, with the tests we have included, with the exhaustive shakedown that will take place before the system is introduced, that there will be no problem with this system.

Mr. **Brown**. Don't be to adamant about it.

Mr. **Frisbie**. I am sorry if I was adamant, Mr. Chairman. But I am convinced, I think, one of the things that we have to do is we have to move on.

There are lots of nay-sayers who will tell you not to move on. We are applying some engineering judgment, granted; that is not infallible. But we think it is good, sound, and well-based engineering.

Mr. **Brown**. The problems of developing a software system involving a million lines of software are very difficult. John Abrahamson is going to be looking at how well you do this very carefully, I am sure.

We hope you succeed on it. We are also deeply concerned about it.

What I would like to do, I don't propose to keep you any longer here this morning, but after our staff has had a chance to look through the testimony in more detail, I think we may want to submit additional questions to you in writing.

As I said earlier, I think you have done a very good job of presenting the program here. We appreciate it very much. If you do nothing more than contribute to my education, it is a worthwhile cause.

Thank you very much, gentlemen, we will be back in touch with you.

The subcommittee will be adjourned.

[Whereupon, at 12:30 p.m., the hearing adjourned.]

APPENDIX

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

NATA
Founded December 28, 1940
NATIONAL AIR TRANSPORTATION ASSOCIATION
4226 King Street • Alexandria, Virginia 22302 • (703) 845-9000

April 18, 1986

The Honorable George E. Brown, Jr., Chairman
Transportation, Aviation and Materials Subcommittee
House Science and Technology Committee
2324 Rayburn House Office Building
Washington, DC 20515

For the Record - Hearings on Fiscal Year 1987 Federal Aviation Administration Budget Request

Mr. Chairman:

The National Air Transportation Association represents the business interests of the nation's Air Taxi airlines and fixed base operators (FBOs). As such, we are vitally concerned with the status of aviation funding.

We commend the Chairman for holding hearings on the Federal Aviation Administration's (FAA) 1987 budget request, and greatly appreciate this opportunity to present our views for the record.

NATA, like the rest of the aviation industry, is frustrated by the existence of a large Aviation Trust Fund surplus and annual funding that does not keep pace with growing demand, much less prepare for future needs. It is obvious that the revenues in the Trust Fund are being held hostage to artificially improve the general fund deficit projections. After five years of funding below the levels authorized in the 1982 Airport and Airways Improvement Act, we are now faced with massive cuts in FAA spending as a result of the Balanced Budget and Emergency Deficit Reduction Act of 1985, commonly referred to as "Gramm-Rudman-Hollings."

The pattern of these cuts is becoming clearer with time and we are very concerned that a continuation of these cuts will lead to a further dismantling of the ATC modernization program.

NATA does not oppose the concept or the objective of reducing the federal deficit. We feel it may be a necessary step in restoring the fiscal health of the economy of the United States. We do, however, object to the tactic of using the Aviation Trust Fund to conceal the true extent of the deficit. Further, we object most strenuously to those funds being held captive when the need for them is current and growing.

Representing Commercial Aviation Service and Transportation Companies

NATA supported the imposition of an increased level of user taxes in 1982, based largely on Administration assurances that the money would be spent as authorized. The trust between the Administration and industry that we confidently felt existed was violated soon thereafter, with diminishing funding levels appropriated to long-term projects.

While we are concerned with funding shortfalls for airspace modernization, the outlook for airports is equally troubling. Funding levels for airports have repeatedly fallen below the authorization levels. For instance, the authorization for FY 1983-1986 was set at $3.542 billion, but $332 million of that amount has not been appropriated. The 1986 appropriation of $925 million was reduced to $885 million by the deficit reduction legislation. The 1987 Administration budget proposes only $712 million instead of the $1.017 billion previously authorized. At this level, airport capacity cannot keep pace with the FAA's projected annual three and one-half to four and one-half percent increase in air traffic demand.

NATA feels very strongly that long-term projects such as airport development must be funded and programmed at a rate to exceed the air traffic system capacity growth or the air transportation industry in the United States will be faced with ever-increasing landing delays, air or ground holding delays, and an increasing number of slot-constrained airports. At present, we are faced with capacity constraints at four major terminals. Knowledgeable industry sources forecast an increase to 22 capacity limited airports within five years. Within ten to fifteen years that number could grow to about 60. Sources within FAA tell us that an annual funding rate of $600 million is needed just to keep pace with safety related items. A full billion dollars per year is need to put the Airport Improvement Plan back on schedule and in synchronization with the Air Traffic Control System's anticipated demand.

The National Airspace System Plan, originally projected to cost $11.709 billion has risen to $12.259 billion with the addition of Terminal Doppler Weather Radar ($550 million). As you know, this program is driven by F&E appropriations. The first year of the Act, 1982, was the only time that the authorization level was met by a full appropriation, and as a result, there is currently an accumulated short-fall of over $1.5 billion, a full 25% less than the amount authorized.

The President proposes that the 1987 budget include $825 million for F&E and predicts subsequent funding at a level of $1.164 billion per year through 1992. If this comes to pass, we are convinced that some programs will be delayed beyond the programmed completion date of 1992. Historically, delay means higher cost...much higher cost.

We know that the FAA has faced some difficult choices due to the failure of appropriations to meet authorized levels. During FY 1986, to make up for the shortfall, projects were funded at the expense of precision approaches, weather reporting equipment and ATC surveillance radar at small community airports. Each of these programs has a direct effect on the safety of general aviation. We contend that there will be no significant breakthrough in general aviation safety until we have precision approach facilities equivalent to those enjoyed by the scheduled air carriers. For this reason, we strongly encourage the necessary appropriations to bring these programs back on schedule.

NATA is concerned with the FAA's decision to go off full funding in 1987 to minimize the impact of reduced appropriations. We appreciate the fact that the budget level was mandated and we understand the reason for purchasing equipment now, with no money available for its installation or upkeep, and hoping that future years will provide such money. However, we do not share the FAA's confidence that the necessary funds will be provided in the future. It is possible that this approach will, in the short-term, preserve the modernization time-table, but we would feel more comfortable if the problem was met head-on by reinstating funding to the programmed levels.

Among the critical programs taken off full funding in the 1987 budget are such vital items as Terminal Doppler Weather Radar, Air Traffic Control Tower modification or replacement, Flight Service Station Automation, Terminal Radar (ASR-9), Microwave Landing System, VHF Directional Finding, Traffic Management Systems and Center Weather Processing. By so doing, the FAA was able to allocate the $91.2 million conserved to nine other programs to keep the NAS Plan close to the schedule. Those projects are Long Range Radar, Central Flow Computers, Loran C, Safety Related Approach Lighting Systems, 95 AWOS Systems, PAPI lighting systems and straight-in non-precision approach lighting systems.

In addition, some R,E&D programs were either slowed or deferred from fiscal year 1987 budgeting. One such program is the Airport Surface Surveillance which encompasses runway intrusion and automation aids. In our opinion, runway intrusion is one of the foremost aviation safety problems.

Another program with development slowed in 1987 is the Data Link Applications Development, a key factor in automated collision avoidance. The development of sensors for Parallel Runway Monitors to insure safety where simultaneous parallel approaches are used is a joint safety and capacity improvement program that is also threatened. Terminal Air Traffic Control Automation is a casualty of the funding reduction as well as further research into technology for development of windshear detection. In addition, funds are not availabe for development of Oceanic Automated Dependent Surveillance.

R,E&D funding for the first five years experienced a shortfall of $126 million dollars. OMB figures for the next five years allow only $127 million per year for a total of $635 million. FAA programs show a need for almost twice that amount. Significantly, these items are of the fixed cost variety and savings can seldom be realized through cancellation.

An examination of the major FY 1987 R,E&D account discloses a total of twelve such programs. Four of these are of long range value and essential to capacity improvement. They also constitute 67.7% of the cost of the FY 1987 program. The four programs are Voice Switching and Control System Development (VSCS), Aircraft Safety, Automated En Route ATC (AERA) and Advanced Automation. Additionally, the FY 1987 program encompasses Separation Standards, Advanced Traffic Management, TCAS, Terminal Weather Radar, NEXRAD, Aviation Security, Aviation Medicine and Aircraft Noise Pollution.

Further, we are concerned with the funding in the operations account. First, we are unequivocally opposed to the proposed 75% Trust Fund contribution to FAA operations. The implication is that only 25% of FAA operations are of general public benefit, a notion that we simply cannot support.

NATA does support funding for the training of new safety inspectors and for the training of systems maintenance personnel. These are long-term requirements and it is extremely short sighted to curtail funding in these critical areas. It is more destructive to the system viability to place partially or inadequately trained personnel in these fields than it would be to leave the position vacant until the person is fully trained. Systems maintenance has already experienced a decline in personnel of about 17% over the past four years. There has been a similar decrease in safety inspectors.

In conclusion, NATA strongly encourages this Subcommittee to do everything possible to fully fund the FY 1987 aviation programs and oppose the Administration's request to eliminate the 2-for-1 penalty provision and interest payments to the Trust Fund. Furthermore, the reauthorization of the Act must include concrete protections up-front to eliminate the underfunding problems we have experienced with the 1982 Act. NATA recommends the reauthorization include the following:

1. Remove the Trust Fund from the unified budget.

2. Establish taxes at a level to fully fund the airport and airways improvement programs and still draw-down the balance to one billion dollars by the end of the program.

3. Establish a tax trigger whereby taxes would be reduced if appropriations fall below authorizations.

With these three protections built in, we feel more comfortable that spending will actually occur at the authorized levels.

The National Air Transportation Association thanks you for the opportunity to present our views on these critical issues.

Sincerely,

L.L. Burian

Lawrence L. Burian
President

LLB/pm

ARINC AERONAUTICAL RADIO, INC.
2551 RIVA ROAD • ANNAPOLIS MARYLAND 21401 • 301-266-4000

April 18, 1986

Rep. George E. Brown, Jr.
Chairman
Subcommittee on Transportation,
Aviation & Materials
House Committee on Science & Technology
2256 RHOB
Washington, D.C. 20515

Dear Chairman Brown:

Thank you for your kind invitation to appear at the hearing on the "Fiscal Year 1987 FAA Research, Engineering & Development Budget Request." I regret that schedule conflicts will make it impossible for me to testify in person. Nonetheless, the questions that have been raised by your Subcommittee on FAA funding the National Airspace System Plan are important, and I would like to make a few observations for the record.

First, Aeronautical Radio, Inc. ("ARINC") is a company which is owned by members of the world's aviation community which provides communications services to that industry on a not-for-profit basis. As such, ARINC reflects the views of its shareholders and more broadly its community of users. I understand that representatives from the Air Transport Association, the Regional Aircraft Association, the National Business Aircraft Association, and the Aircraft Owners & Pilots Association, will be testifying before your Subcommittee. As to the specific questions before the Subcommittee, ARINC will follow the lead of our users, which are presented by those organizations.

Notwithstanding the views of the various components of aviation on the NAS Plan and the related sufficiency of fiscal-year 1986/87 budget requests for the FAA and the NAS Plan, ARINC is concerned that the industry is encountering unnecessary and undesirable delays in national airport and airways improvements for which the traveling public has already paid through excise taxes on airline tickets and aircraft fuel.

A SUBSIDIARY OF ARINC INCORPORATED
OVER FIFTY YEARS OF SERVICE TO THE AIRLINE INDUSTRY

Rep. George E. Brown, Jr.
April 18, 1986
Page 2

The Aviation Trust Fund, which is to be used mainly for airport and airways improvements has grown to $7.88 billion at the end of 1985; but conversely, needed spending on the national airspace to support essential modernization of facilities may be reduced. We understand that in order to reduce the national deficit, reductions in spending throughout government are necessary, but it is difficult to understand the application of spending reductions to fully funded trust fund projects. Accordingly, it may well be necessary or desirable to remove the Trust Fund from the General Fund budget process, and perhaps to consider other structural changes necessary to ensure improved responsiveness to the needs of the aviation industry and the flying public.

In short, ARINC supports full funding of FAA programs, including the NAS Plan, and the release of Trust Fund money to support those programs.

Yours truly,

George F. Mansur

George F. Mansur
President

ARINC AERONAUTICAL RADIO, INC.
2551 RIVA ROAD • ANNAPOLIS MARYLAND 21401 • 301-266-4000

April 13, 1986

Mr. Scott Crossfield
Staff Member
Subcommittee on Transportation,
  Aviation & Materials
House Committee on Science & Technology
2256 RHOB
Washington, D.C. 20515

Dear Scott:

I am sorry that my busy travel schedule has made it impossible for me to discuss the NAS Plan and its funding with you. As John Bartlett has explained, ARINC follows the aviation industry on broad issues of air space planning and does not want our concerns with FAA's approach to the National Airspace System Plan to affect the budget and funding process for the FAA.

In 1983, I chaired a blue ribbon panel of the Armed Forces Communications and Electronics Association (AFCEA), which was convened to review the communications aspect of the NAS Plan. I am including a copy of the report of that panel which is highly critical of the NAS Plan. This report is nearly three years old, but few, if any, of the concerns raised by the AFCEA panel have been addressed by the FAA since the report was presented to the agency. This report is for your information to use as you see fit. I do not think it appropriate for the hearing record.

Even if the NAS Plan had presented an adequate approach to airspace facilities, it would have been rendered moot by advances in aeronautical satellite planning. It is probable that by 1990, there will be an aeronautical satellite system which can support air traffic control (ATC), aircraft operational control (AOC), navigation, surveillance, and air/ground telephone service (private correspondence). This system will initially cover North America and the oceanic regions on either side of the continent. At the direction of its Board, ARINC is moving forward to ensure that such a satellite system is established. The present NAS Plan, however, does not recognize this development at all.

A SUBSIDIARY OF ARINC INCORPORATED
OVER FIFTY YEARS OF SERVICE TO THE AIRLINE INDUSTRY

As you may know, the ARINC Board of Directors is different than a Board of Directors of a normal commercial company. The ARINC Board consists of individuals drawn from a number of the nation's air carriers, including large carriers such as United, American, Eastern and Pan American as well as smaller carriers such as Air Wisconsin. These Directors represent their individual corporate views and those of the ARINC shareholders at large, but they also strive to represent the views of the totality of the users of ARINC services. ARINC stockholders alone now operate some 3,000 large jet aircraft and represent a number of general aviation and business aviation users.

Last July, the ARINC Board established an industry program looking towards the implementation of an integrated aeronautical satellite system. Such a system would follow the normal industry standardization processes and forums, e.g., the Airlines Electronic Engineering Committee (AEEC). The work to achieve a worldwide consensus on system characteristics is well underway. Last month, more than two dozen representatives of air carriers throughout the world, in conjunction with avionics suppliers, communications firms, and governmental representatives, met in AEEC's first meeting to begin work on a set of comprehensive specifications. The essential features will be complete prior to the end of the third quarter of 1986 -- a very ambitious schedule commensurate with the importance of the project to aviation and administrations alike. Last week, two working groups of the Subcommittee, which are to adopt antenna design and signal-in-space characteristics, established tentative sets of parameters for the system. Thus, we are confident that the ambitious schedule can be met.

Because the aeronautical satellite system will cause fundamental changes to the way airspace is managed and how communications are provided, we would like to have the opportunity to brief you and other members of the staff on the program, where it is going, and what it promises to do.

In addition, the industry is concerned with the Federal Communications Commission (FCC) Docket on Land Mobile Satellite Services. In 1971, after careful consideration and study, the International Telecommunication Union (ITU) allocated spectrum for an aeronautical satellite system which would serve the industry through the year 2000. The FCC, however, is now considering allocation of all or a portion of that aeronautical spectrum to a Land Mobile Satellite System (LMSS). Unchallenged studies by ARINC and ATA, by the FAA, and by ICAO in its Future Air Navigation Systems (FANS) panel, all agree that the full 28 MHz of spectrum currently available will be required for the aeronautical satellite system.

Moreover, sharing of the frequencies with what will become a consumer service, perhaps similar to CB, would have serious impact on the safety of air transportation. Unlike aircraft avionics, which are subject to rigorous requirements for maintenance and testing, general subscriber units of the type which would be used with LMSS would be subject to misuse, abuse, and inadequate maintenance, all of which could have disastrous effects on the high priority aeronautical safety communications.

We would appreciate the opportunity to meet with your staff at your convenience.

Yours truly,

George F. Mansur
President

Enclosure

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#1

United States General Accounting Office

GAO

Briefing Report to Congressional Requesters

April 1986

AVIATION WEATHER HAZARDS

FAA System for Disseminating Severe Weather Warnings to Pilots

GAO/RCED-86-152BR

61-662 O - 86 - 11

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,
AND ECONOMIC DEVELOPMENT
DIVISION

APR 22 1986

B-222882

The Honorable George E. Brown, Jr.
Chairman
The Honorable Dan Glickman
Ranking Majority Member
The Honorable Tom Lewis
Ranking Minority Member
Subcommittee on Transportation,
Aviation and Materials
Committee on Science and Technology
House of Representatives

On August 14, 1985, you requested that we investigate the Federal Aviation Administration's (FAA's) current procedures for disseminating severe weather information in airport terminal areas. You expressed particular concern about frequent reports that pilots are not provided timely information about potentially hazardous weather during the critical takeoff and landing phases of flight. You asked that we determine if dissemination of severe weather warnings to pilots was timely, and if not, was the problem due to:

--technology,

--procedures,

--a result of a lack of experienced controllers,

--a result of saturation areas in the air traffic system, or

--a result of other possible contributing causes.

We briefed your offices on the results of our work on March 4, 1986; as requested, this briefing report summarizes the information discussed during that meeting.

Limitations in the existing aviation weather system hinder timely detection and dissemination of potentially hazardous weather conditions and can result in insufficient weather information being available to pilots during critical takeoff and landing phases of flight. Specifically, we found that existing FAA airport radars have limited real time[1] weather detection capability and are designed primarily for keeping aircraft separate. They cannot discern the types and severity of weather. We also found that hazardous weather warnings are frequently not provided to pilots as soon as they are available because controllers are too busy separating aircraft during peak traffic periods.

As agreed with your office, we examined FAA's current policy and procedures for disseminating hazardous weather information at the nation's five busiest airports: Chicago's O'Hare, Atlanta's Hartsfield, Los Angeles International, Dallas/Ft. Worth International, and Denver's Stapleton. We reviewed local facility procedures and interviewed air traffic controllers and supervisors at these facilities to obtain their perceptions of whether hazardous weather information is being provided to pilots as quickly as available. We interviewed FAA headquarters officials responsible for implementing National Airspace System plan aviation weather programs, and reviewed planning documents and reporting requirements to identify any problems and their planned solutions for weather information dissemination. In addition, we used data obtained from a statistically valid nationwide sample of FAA controllers[2], as well as documentary evidence of the actual hazardous weather messages provided pilots. We did not independently verify what FAA sources told us about the existing weather detection systems, but we did assess controller views about how experience level and work load effect weather information dissemination.

We did not obtain written comments on this report, but did discuss its contents with FAA officials. They concurred with the facts, and their comments have been included where appropriate.

As you know, FAA is developing several new weather detection and dissemination technologies as part of its National Airspace System plan. As agreed with your office, we will examine these planned new weather systems to ascertain how likely they are to assure better weather detection and dissemination.

---

[1] Real time is the period in which the occurrence and reporting of an event are almost simultaneous

[2] Aviation Safety: Serious Problems Concerning the Air Traffic Control Work Force (GAO/RCED-86-121, March 6, 1986).

We plan no further distribution of this report until 7 days from the date of this letter. At that time we will provide copies to FAA and make copies available to others upon request. If you have any further questions on these matters, please contact me at 275-7783.

Herbert R. McLure

Herbert R. McLure
Associate Director

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ABBREVIATIONS

AIRMET	Airmen's Meteorological Information
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
CWA	Center Weather Advisories
FAA	Federal Aviation Administration
FPL	Full Performance Level
GAO	General Accounting Office
LWAS	Low Level Wind Shear Alert System
NAS	National Airspace System
NWS	National Weather Service
PIREP	Pilot Report
SIGMET	Significant Meteorological Information
TDWR	Terminal Doppler Weather Radar

FEDERAL AVIATION ADMINISTRATION
SYSTEM FOR DISSEMINATING
SEVERE WEATHER WARNINGS TO PILOTS

PREPARED AT THE REQUEST OF THE
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPESENTATIVES

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ISSUES ADDRESSED

GAO WAS ASKED TO DETERMINE IF DISSEMINATION OF SEVERE WEATHER WARNINGS TO PILOTS WAS TIMELY, AND IF NOT, WAS THE PROBLEM DUE TO:

- TECHNOLOGY
- PROCEDURES
- A LACK OF EXPERIENCED CONTROLLERS
- A RESULT OF SATURATED POINTS IN THE HUB-AND-SPOKE TRAFFIC SYSTEM, OR
- A RESULT OF OTHER POSSIBLE CONTRIBUTING CAUSES

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ISSUES GAO WAS ASKED TO ADDRESS

On August 14, 1985, you requested an investigation of FAA's current procedures for disseminating severe weather information to inbound and outbound flight crews in terminal areas. You expressed particular concern about frequent reports that pilots are not provided timely information about potentially hazardous weather during the critical takeoff and landing phases of flight. You asked that we determine if there is a problem and, if so, whether the problem is technological, procedural, or stems from a lack of experienced controllers, saturated points in the hub-and-spoke traffic system, or other possible contributing causes.

REVIEW SCOPE

- WE VISITED AND OBTAINED DATA FROM THE FOLLOWING:
  - 5 BUSIEST AIRPORTS

    CHICAGO O'HARE
    ATLANTA HARTSFIELD
    DALLAS/FT. WORTH INTERNATIONAL
    DENVER STAPLETON
    LOS ANGELES INTERNATIONAL

  - FEDERAL AVIATION ADMINISTRATAION

    AVIATION WEATHER PROGRAM

    AIR TRAFFIC SERVICE

- WE USED A NATIONAL SURVEY OF RADAR-QUALIFIED AIR TRAFFIC CONTROLLERS
  - 20 EN ROUTE CENTERS
  - 54 TERMINAL FACILITIES

SCOPE OF REVIEW

As agreed with your office, we determined whether FAA's current weather procedures were being followed at the nation's five busiest airports: Chicago, Atlanta, Los Angeles, Dallas/Ft. Worth, and Denver. These airports were selected because they had the largest number of commercial aircraft operations in the country during 1985. We interviewed air traffic controllers and supervisors at both FAA's air traffic control towers and terminal radar approach control facilities at these airports because they are responsible for providing severe weather information to pilots.

We asked them how they disseminate weather information and obtained their perceptions about whether it was provided as quickly as possible, and if not, why.

We interviewed FAA headquarters officials responsible for implementing National Airspace System (NAS) aviation weather programs to determine existing and planned weather detection and dissemination capabilities. We interviewed Air Traffic Service officials and examined FAA policy and procedures for weather dissemination to assess facility compliance with agency standards.

In addition, we used data from a GAO survey of radar certified controllers conducted at 74 FAA facilities between May 2, and July 26, 1985. The principal purpose of the survey was to determine how prevalent those directly involved in air traffic control feel certain problems are. The survey covered such issues as workload, staffing levels, and training of developmental controllers. The results of the survey were published in Aviation Safety: Serious Problems Concerning the Air Traffic Control Work Force (GAO/RCED-86-121, March 6, 1986).

RESPONSIBILITIES FOR PROVIDING AVIATION WEATHER DATA

- STATUTORY: FEDERAL AVIATION ACT OF 1958
  - FAA PROVIDES EQUIPMENT AND PERSONNEL FOR DISSEMINATING WEATHER INFORMATION
  - NWS PROVIDES WEATHER REPORTS, FORECASTS, AND WARNINGS TO FAA
  - FAA ORDER: CONTROLLER RESPONSIBILITY
  - FIRST PRIORITY IS AIRCRAFT SEPARATION AND COLLISION AVOIDANCE
  - WEATHER INFORMATION IS PROVIDED BY CONTROLLERS AS TIME ALLOWS

STATUTORY RESPONSIBILITIES FOR PROVIDING AVIATION WEATHER DATA

FAA's primary mission, stated in the Federal Aviation Act of 1958, as amended (49 U.S.C. 1463), is to assure safe and efficient use of airspace. In fulfilling this mission, FAA is responsible for providing aviation weather information to pilots. The act directs FAA to develop, procure, operate, and maintain equipment for disseminating weather information. In addition, the act directs the National Weather Service (NWS) to provide FAA with reports, forecasts, and warnings for aviation use.

FAA AIR TRAFFIC CONTROL ORDER: CONTROLLER RESPONSIBILITY

Air traffic controllers currently disseminate hazardous weather information to pilots. According to FAA's "Air Traffic Control" handbook--FAA 7110.65D, the controllers' first priority is separating aircraft. However, additional duties, such as providing pilots with weather information, are to be accomplished "to the extent possible" contingent on other, higher priority duties. In addition, each of the major terminal facilities has similar orders and policies governing controller responsibilities for disseminating aviation weather hazards information to pilots. (See page 21.)

SOURCES OF HAZARDOUS WEATHER INFORMATION

○ FIVE PRIMARY SOURCES OF HAZARDOUS AVIATION WEATHER INFORMATION AT MAJOR AIRPORTS

- SIGMETs: SEVERE WEATHER WARNINGS FROM NWS
- CWAs: WEATHER ADVISORIES FROM FAA EN ROUTE CENTERS
- PIREPs: PILOT REPORTS OF IN-FLIGHT WEATHER CONDITIONS
- ASRs: AIRPORT RADARS WITH LIMITED WEATHER DETECTION CAPABILITIES
- LLWASs: SURFACE WIND SHEAR DETECTION DEVICES

FIVE SOURCES OF HAZARDOUS AVIATION WEATHER INFORMATION

Terminal air traffic controllers provide pilots with hazardous weather information for the critical takeoff and landing phases of flight from five primary sources:

--NWS Significant Meteorological Information Advisories (SIGMETs),

--FAA's Center Weather Advisories (CWAs),

--FAA's Pilot Reports (PIREPs)

--FAA's Low Level Wind Shear Alert Systems (LLWASs), and

--FAA's Airport Surveillance Radars (ASRs).

SIGMETs

SIGMETs are severe weather advisories issued in hourly and special bulletins for the eastern, central, and western regions of the country by NWS in Kansas City, Missouri. There are three kinds of these severe weather advisories. Convective SIGMETs are warnings of the most severe weather conditions; they are issued for tornadoes and very severe thunderstorms. SIGMETs are issued for severe and extreme turbulence, icing, and widespread obstructions to visibility such as sand and dust. AIRMETs are less extreme potential hazards to aircraft such as moderate icing conditions. All of these NWS weather advisories are referred to in this report simply as SIGMETs.

CWAs

CWAs are unscheduled severe weather advisories. They are developed by Center Weather Service Unit meteorologists at FAA's 20 air route traffic control centers in the continental United States through analysis and interpretation of area forecasts,

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terminal forecasts, SIGMETs, PIREPs and other sources of available weather information. CWAs may also supplement or redefine existing SIGMETs.

PIREPs

PIREPs are reports from pilots concerning hazardous and routine in-flight weather conditions. FAA requires pilots to give information to ground facilities, such as airport towers, whenever ceilings are reported or forecast at or below 5,000 feet; or when visibility is reported or forecast at or less than 5 miles; or if either thunderstorms, light icing conditions, moderate turbulence, or wind shears[1] are reported or forecast for the area.

ASRs

ASRs are aircraft surveillance radars. The radars collect data that identify aircraft location, altitude, airspeed, and flight number and display the data on the controller's display. The display is the controller's primary means of "seeing" and separating aircraft. The radars also detect precipitation but do not differentiate between its type or severity and cannot detect turbulence. Also, the controller display does not show weather and aircraft data simultaneously. To obtain weather data, the controller must adjust the display, thereby removing information on aircraft altitude, airspeed, and flight numbers.

LLWAS

LLWASs are surface wind shear detection devices composed of five wind sensors located around the airport, a sixth sensor at the center-field location, and a small processor that continuously compares the difference in wind speed and direction of these sensors with the centerfield location. LLWAS provides pilots and controllers with information on potentially hazardous surface wind conditions at or near the airport. When more than a 15-knot difference in windspeed exists between any of the sensor locations and the center-field sensor, a wind shear alert device sounds an alarm. The controller provides the wind shear alert to incoming and departing pilots. At present, about 80 of these systems are in operation and an additional 30 are planned to be installed by 1989. In addition, an enhanced low level wind shear alert system is planned for these 110 locations with twice the number of remote wind sensors to detect microbursts.[2]

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[1] Wind shear refers to large and rapidly changing variations in air velocity over small distances. The most serious effects of wind shear for aircraft are loss of lift and altitude. This is particularly hazardous when an aircraft is close to the ground, either landing or taking off.

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[2] Microbursts are a form of wind shear in which air descends rapidly downward. When the descending air strikes the earth's surface, it spreads in all directions causing an aircraft to encounter increasing head winds and when a pilot attempts to compensate by reducing power to maintain target airspeed, he quickly flies into the descending air. By that time, the aircaft nose is usually down, power is throttled back, and there may not be enough power for the pilot to return aircraft to full power before the combination of sinking air and increasing tail wind forces the airplane to the ground.

TECHNOLOGICAL LIMITATIONS AFFECTING WEATHER DISSEMINATION

- EXISTING AIRPORT WEATHER DETECTION AND DISSEMINATION TECHNOLOGIES ARE LIMITED
  - RADARS DETECT ONLY PRECIPITATION, NOT SEVERE WEATHER
  - WIND SHEAR DETECTION SYSTEM MAY NOT DETECT MICROBURSTS AND FREQUENTLY REPORTS ARE FALSE ALARMS
  - NO AUTOMATED SYSTEM EXISTS FOR DISSEMINATING HAZARDOUS WEATHER TO PILOTS

HAZARDOUS AVIATION WEATHER DETECTION AND DISSEMINATION TECHNOLOGIES ARE LIMITED

The current aviation weather system is limited in its ability to rapidly acquire weather data and to process and disseminate operationally significant information to pilots. Capabilities to detect real-time, hazardous weather information that could adversely affect safety are also limited. This is evident in the five systems we examined. These systems do not provide adequate and timely hazardous weather warnings in the terminal area because existing airport surveillance radars do not discern the type and severity of weather; the low level wind shear warning system is not reliable and currently cannot detect microbursts; and there are no automated systems for disseminating weather warnings to pilots.

Radar precipitation reflections and storm severity

ASRs are designed to detect aircraft, not weather. Controllers cannot determine storm intensity, specific locations, or areas of dangerous clear air accompanying storms from the radar's precipitation reflections. Without such information, controllers are reluctant to advise or suggest alternative routes through bad weather.

Beginning in 1987, FAA plans to replace existing ASRs at 101 high density airports with ASR-9s, the latest state-of-the-art surveillance radars. In addition to improving surveillance, ASR-9s will have near real-time weather processing capabilities on an independent weather channel. The weather channel will provide controllers with a graphic outline of the hazardous weather in the terminal area and differentiate any two of six intensity levels of severe weather established by the National Weather Service.

Wind shear and microburst detection

LLWAS does not provide reliable detection of microbursts, the most dangerous, downward-rushing type of wind shear, according to the report of the Committee on Low Altitude Wind Shear and Its Hazard to Aviation of the National Research Council, National Academy of Science. Moreover, the present LLWAS sensors frequently provide false alarms. We were told by an FAA official that pilots tend to disregard LLWAS warnings because of these problems.

Microbursts may not be detected because of their small size and the location of LLWAS sensors on the airfield, according to the National Academy of Sciences report.[3] LLWAS has six sensors distributed over an entire airfield. Microbrusts may hit the ground between the sensors. In addition, the committee, made up of National Center for Atmospheric Research, Air Force Geographics Laboratory, and National Severe Storm Laboratory officials, reported that some microbursts may never strike the ground, failing to trigger ground-based sensors. Also, should microbursts occur outside of the airport perimeter on flight paths where aircraft are still close to the ground, they would not be detected by LLWAS. Despite these limitations, LLWAS is the only available operational means of detecting wind shears at airports.

According to FAA officials, LLWAS false alarms are caused by air turbulence created by large aircraft and winds deflected from large structures shielding sensors from winds. At the Chicago and Atlanta airports, for example, we observed pilots routinely taking off and landing through wind shear alerts. A controller at Chicago O'Hare told us that frequent alerts at one location were caused by prevailing winds deflected from a large building. He told us that he was confident that the alerts from that sensor were false alarms but that controllers would still provide the warnings to pilots.

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[3] Low-Altitude Wind Shear and Its Hazard to Aviation, National Academy Press, ISBNO-309-03432-9, 1983.

FAA is attempting to improve LLWAS performance. The number of airport sensors is being increased from 6 to 12 to assure broader airfield coverage. New software is being developed for the processor to provide more data. By 1990, 12-sensor LLWASs with improved software and new controller displays are to be installed at all 110 LLWAS locations.

FAA also plans to develop the terminal doppler weather radar (TDWR) to enhance weather detection, primarily wind shear and microbursts in terminal areas. The TDWR should provide the controller with real-time detection and warning of these phenomena for immediate dissemination to pilots. According to FAA officials responsible for implementing the enhanced LLWAS, TDR and LLWAS will be companion systems and weather information from both will be given to pilots.

Automated communications won't exist until 1990's

No automated system for disseminating hazardous weather information to pilots currently exists. FAA depends on controllers to disseminate SIGMETS, CWAs, and other hazardous weather messages to pilots when their primary duties allow. They do not always have time to promptly provide weather warnings. The agency plans to develop technologies with the capability of exchanging real-time hazardous weather information among aircraft and various detection devices and data bases. However, this critical data link service is not scheduled to be implemented before the 1990's.

PROCEDURAL PROBLEMS DISSEMINATING WEATHER INFORMATION AS QUICKLY AS POSSIBLE

- PROCEDURAL PROBLEMS CONTRIBUTE TO LACK OF PROMPT DISSEMINATION
  - PASSING SIGMETS AND CWAs FROM CONTROLLER TO CONTROLLER TO READ ON HIS/HER FREQUENCY IS NOT FAST ENOUGH
  - PILOTS MAY MISS WEATHER WARNINGS BECAUSE OF RADIO FREQUENCY CHANGES

PROCEDURAL PROBLEMS CONTRIBUTE TO LACK OF TIMELY WEATHER DISSEMINATION

The principal procedural problem in disseminating weather information is a lack of prompt communication of weather information from air traffic controllers to pilots. We found that weather warnings are often delayed because of the procedure of passing weather messages from one contoller to another. Moreover, pilots may miss weather messages because they must frequently change radio frequencies when passing from one controller's sector of airspace to another's.

The procedure of passing SIGMETs and CWAs from one controller to another hinders prompt weather dissemination. SIGMETs and CWAs are received at the terminal on a teletypewriter. Under existing procedures, the teletyped strips of paper containing weather information are given to one controller by the supervisor to read to pilots on his radio frequency. When finished, the controller passes the strips to the next controller position in the arrival and departure sequence. This procedure continues until the strips are read at all terminal controller positions. Controllers read these warnings as time permits. If they are busy separating aircraft, the warnings are delayed, and in some cases not given.

The average time taken to disseminate SIGMET and CWA severe weather advisories at Dallas/Ft. Worth was 23 minutes. This represents an average time for 50 SIGMETs and CWAs to be read during a 2-week period from November 19 to December 1, 1985. This average consisted of the elapsed time between the first and last reading of each weather warning. Dallas/Fort Worth data were a result of a facility order creating a special recording form following the Delta Air Lines accident last August.

The other four major airports we visited did not have a similar reporting form to record the time when SIGMETs and CWAs

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were read by the controllers. While the average time at Dallas/Fort Worth may not be representative of all five major airports, they all follow the same procedure of passing SIGMETs and CWAs from one controller to another.

Another procedural problem with disseminating SIGMETs and CWAs concerns numerous changes in radio frequencies. When passing from one controller's airspace into another, pilots must switch radio frequencies. SIGMETs and CWAs may be missed if the pilot is leaving airspace where the warning has not yet been transmitted but is entering airspace where the warning has already been read.

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CONTROLLER EXPERIENCE MAY AFFECT WEATHER DISSEMINATION

- CONTROLLERS ARE DIVIDED ON HOW EXPERIENCE AFFECTS WEATHER DISSEMINATION
- GAO SURVEY SHOWS CONTROLLERS BELIEVE WEATHER TRAINING IS NOT ADEQUATE
- GAO REPORTED THAT DECLINING NUMBERS AND EXPERIENCE LEVEL OF AIR TRAFFIC CONTROLLERS AFFECTS SAFETY

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CONTROLLERS ARE DIVIDED ON HOW THEY BELIEVE EXPERIENCE LEVEL AFFECTS WEATHER DISSEMINATION

We received differing views from the controllers we talked to at five airports concerning the effect of experience on timely dissemination of aviation weather information. The majority of controllers said they did not believe controller experience significantly affects timely dissemination of aviation weather information. Some controllers, however, disagreed. They told us that less experienced controllers may require more time to separate aircraft, thereby having less time to disseminate weather information. Further, some controllers feel that less experienced controllers may not be as well prepared to deal with the unusual situations that accompany hazardous weather conditions.

GAO's national controller survey covered controller training for bad weather conditions. The results suggest support for the views of some controllers that less experienced controllers may need more time to control traffic, thereby leaving less time to disseminate weather information, and that less experienced controllers may be less able to deal with unusual situations accompanying hazardous weather conditions. When asked to rate the quality of on-the-job training given developmental controllers for handling heavy traffic, 37 percent of the 3,282 controllers responding to the survey rated this training as less than adequate. Moreover, 55 percent of the controllers rated training for controlling aircraft in bad weather as less than adequate.

GAO reported that both the number and experience level of air traffic controllers are significantly lower than before the 1981 strike, and that the Flight Safety Foundation concluded that the system is less safe now than it was in 1981. Nationwide, the number of full performance level (FPLs) controllers was

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13,205 as of July 31, 1981, and only 8,315 as of September 30, 1985. Similarly, the number of FPLs at the five busiest airports was 418 in July 1981, and was 291 in September 1985. (See table.)

Number of FPLs Before and After Strike

Airport	FPLs as of July 1981 pre-strike	FPL As Of Sept. 1985	Decrease in number of FPLs	Percent of decline
Chicago	81	76	(5)	6
Dallas	93	59	(34)	37
Atlanta	104	69	(35)	34
Denver	61	37	(24)	39
Los Angeles	79	50	(29)	37
Totals	418	291	(127)	30

While the number of full-performance-level controllers has decreased, the number of developmental, less experienced, controllers has increased from 3,039 to 4,217 nationwide. At the nation's five busiest airports, the number of developmental controllers has increased from 25 in July 1981 to 140 in September 1985.

HUB-AND-SPOKE TRAFFIC SYSTEM HINDERS TIMELY WEATHER DISSEMINATION

- CONTROLLERS SAY THEY ARE HANDLING TOO MUCH TRAFFIC DURING PEAK PERIODS

- CONTROLLERS SAY THEY ARE SOMETIMES TOO BUSY HANDLING TRAFFIC DURING PEAK PERIODS TO GIVE WEATHER INFORMATION

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HUB-AND-SPOKE TRAFFIC SYSTEM HINDERS TIMELY WEATHER DISSEMINATION AT AIRPORTS

The hub-and-spoke operating pattern currently used by many commercial airlines results in airplanes arriving and departing in clusters during peak passenger travel hours and tends to create periods of high density traffic that can delay dissemination or result in denial of hazardous weather information to pilots. Controllers at each of the five airports we visited stated they occasionally do not have time to give weather information to pilots, particularly during peak traffic periods. Similarly, our nationwide survey of controllers showed that controllers sometimes are too busy to give weather information.

About two-thirds of the controllers we interviewed at the five airports, told us they occasionally delay or do not give weather information to pilots because they are too busy separating traffic. GAO's national survey confirmed that weather advisories are not always given. Overall, 53 percent of the responding controllers in the national survey reported they occasionally do not provide weather advisories to pilots, and one in five of the 3,282 controllers responding said they often decline to give weather advisories.

When asked how often, if ever, they decline to provide weather advisories, controllers represented in GAO's national survey from the five busiest airports responded:

	Chicago	Atlanta	Denver	Los Angeles	Dallas
	(Percentage)				
Very often	8	13	6	0	9
Often	14	4	17	0	7
Occasionally	35	23	37	9	26
Seldom if ever	43	60	40	91	58

Controllers and their supervisors told us that the reason they do not give weather information is that they are too busy with their first priority duty of separating air traffic.

Seventy percent of the controllers responding to our nationwide survey felt they were handling more traffic during peak periods than they should have been. Similarly, 63 percent of the controller responses in the national survey from the five airports we visited indicated controllers felt they were handling too much traffic during peak periods. Controllers in our national survey were asked if they believed that they typically are required to handle more traffic than they should be handling, less than they should handling, or an appropriate amount of traffic while working radar during peak periods. Their responses are shown below.

Category	Nation-wide average	Atlanta	Chicago	Dallas Ft. Worth	Denver	Los Angeles
	----------------------(percentage)---------------------					
Much more	15	9	6	16	13	10
Somewhat more	55	48	53	63	58	10
Appropriate level	28	41	41	21	29	70
Somewhat less	2	2	0	0	0	10

Not only did controllers believe they were handling more traffic during peak periods than they should, their supervisors believedthat the traffic workload was having some negative impact on system safety. Seventy-eight percent of the supervisors represented in GAO's nationwide survey indicated that the amount of traffic was having a negative impact on maintaining system safety. Supervisors were asked how much positive or negative impact, if any, the amount of traffic workload was having on maintaining system safety. Their responses are shown below.

	Total percent of supervisors
Significant positive impact	4
Some positive impact	6
No impact	13
Some negative impact	54
Significant negative impact	24

CONCLUSIONS

- CONTROLLERS SOMETIMES DO NOT HAVE TIME TO DISSEMINATE WEATHER
- HAZARDOUS WEATHER INFORMATION MAY NOT BE PROVIDED FAST ENOUGH TO AVOID HAZARDS
- AIRPORT HAZARDOUS WEATHER DETECTION IS LIMITED

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CONCLUSIONS

Controllers at the nation's busiest airports sometimes do not have time to disseminate weather information to pilots. In addition, when weather information is given, it may not be given as soon as possible because controllers are too busy performing their primary duty of separating aircraft. FAA's procedure for communicating weather warnings by having controllers read them over their radio frequencies is too slow to avoid potential hazards, and some pilots may not receive any warning because of radio frequency changes. On-airport weather detection systems (LLWAS and ASR) do not provide controllers adequate detection or information about potentially hazardous weather because the radar cannot detect storm intensities, and the wind shear system cannot reliably detect the most dangerous form of wind shear, microbursts.

The lack of controller time for disseminating weather information, combined with deficiencies in existing weather detection and reporting, can result in insufficient weather information being available to pilots during the critical takeoff and landing phases of flight.

FAA is developing several new weather detection and dissemination systems as part of the NAS plan to address these deficiencies. Specifically, improved airport surveillance radars are supposed to have real-time weather detection capabilities for the terminal areas. Also, terminal doppler weather radars and an enhanced LLWAS are being developed in order to improve detection of wind shear, primarily microbursts. Weather information is planned to be made available to pilots through improved data collection and processing capabilities and direct communications links between ground and air.

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